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ABSTRACT

This document is the third in a series of three documents, which together contain 27 case studies on the uses of cost analysis in educational planning. The case studies have been presented to help planners and administrators see how cost analysis can be used to improve the efficiency of their educational systems, and to get the best value from their existing resources. Topics examined in these case studies include using cost analysis to improve the efficiency of school building in the United Kingdom, planning in university systems in Canada, the costs of secondary education in Morocco, improving efficiency in the utilization of teachers in technical education, comparative costs and efficiency in full-time and part-time education in the USSR, and programing annual current and capital expenditures during the planning period in Hungary. Three case studies dealing with Uganda consider an evaluation of educational costs, the behavior of nonteacher recurring expenditures, and the use of cost evaluation in the planning of a university college. (Author/DN)

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Managing educational costs by Philip H. Coombs and Jacques Hallak

A synthesis report on the IIEP research project. Part I presents highlights of the 27 case studies; Part II provides some basic insights into the nature and behaviour of educational costs that are prerequisite to the practice of cost analysis; Part III gives a wide variety of guides, practical tips and precautions for applying cost analysis in particular situations. (Note: This volume is published by Oxford University Press, New York, London and Toronto).

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Educational cost analysis in action: case studies for planners—III

An IIEP research project directed by
Philip H. Coombs *and* Jacques Hallak

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Preface

During the Second United Nations Development Decade most countries, whether industrialized or 'developing', will be facing increasingly pressing financial strain in meeting their enormous and urgent needs in the realm of education.

Both planners and administrators will in future have to take into greater account the economic aspects involved in their plans, and explore every means of improving the efficiency of their educational systems so as to get the best value from existing resources. Experience has proved that an indispensable technique for this purpose is analysis of the costs of education, by means of which it is possible to:

check the economic validity of educational plans;
draw up a precise programme of expenditure over the planning period;
estimate both the costs and the real economic consequences of specific projects;
facilitate decision-making when several alternative possibilities exist for the allocation of funds.

To illustrate these techniques as clearly as possible the International Institute for Educational Planning (IIEP) put in hand, in 1968, a large-scale research project on the uses of cost analysis in educational planning. The aim of the study was to carry out a pragmatic inquiry into actual practice in order to provide planners with a general view of the various ways of using cost analysis and with practical hints on the application of these ways to their own particular needs. Mr. Philip H. Coombs, the former Director of the Institute, was responsible for the technical direction of the work, assisted by Mr. Jacques Hallak, also of the Institute, and with the co-operation of a number of IIEP staff members; the project took over two years and was carried out in three stages.

In the first stage, a methodological note was prepared, laying down the general lines on which the research would be carried out. As many examples as possible of experiences in this field were considered, from which a diversified sample of 27 cases was selected for study in depth.

The second stage was to gather and analyse the statistical information for each case in this sample, and to compile an analytical report based on the data collected for each case study. For these activities the IIEP was greatly assisted by the co-operation of specialists in the various countries and of international experts, especially those of Unesco.

In the third stage the guidelines and principal lessons emerging from an analysis of all the case studies were summed up by Mr. Coombs and Mr. Hallak in a synthesis report (which is being published separately).

The project was financed principally by the United States Agency for International Development (USAID) and the Swedish International Development Authority (SIDA), to whom the IIEP wishes to express its deepest gratitude. The Institute would also like to thank the many officials, educators, and specialists who, both in the countries studied and in the various Departments of Unesco, have unstintingly given us their assistance in bringing this project to fruition. Responsibility for the content of all reports, however, rests with the authors named.

RAYMOND POIGNANT
Director, IIEP

An introductory explanation

The twenty-seven case studies carried out by the IIEP on the uses of cost analysis in educational planning are extremely diversified in every respect. They are widely scattered geographically; they are fairly well distributed by level and type of education or training (the two notable deficiencies being teacher training and non-formal education); they vary in breadth of coverage, ranging from individual projects to entire formal educational systems; and, most important, they illustrate the diversity of uses to which cost analysis can be put.

Broadly speaking, the cases illustrate seven principal purposes which cost analysis can serve: (1) costing and testing the economic feasibility of educational plans; (2) evaluating and improving the allocation of available educational resources (e.g. by principal levels and types of education); (3) weighing the comparative advantages of alternative ways to pursue the same educational objectives; (4) determining both the short- and long-term cost implications of a particular project; (5) estimating the introductory costs and the likely longer-term cost impacts of a major educational innovation; (6) conducting a general search for ways to improve efficiency and productivity; and (7) checking the economic implications and feasibility of special policy decisions before they are made.

The case studies can also be usefully classified from a different angle, according to three degrees of educational change involved: (1) the linear expansion of an existing educational system or sub-system without substantial change in its characteristics (the simplest case); (2) significant modifications of existing educational arrangements aimed at improving the qualitative performance and efficiency of the system, but still without radically altering its form and methods (decidedly more difficult); and (3) fundamental innovations aimed at drastically altering the system's structure, content, and performance, or even creating alternative teaching-learning 'systems' to replace or supplement the old ones (the most complex case).

About half of the case studies were prepared entirely by IIEP staff members from original documentation, supplemented where necessary by field visits. The rest were prepared under IIEP guidance by outside consultants with first-hand knowledge of the case in question. The descriptions of the authors given at the opening of each case study refer to the positions they held at the time the studies were prepared.

As might be expected, the cases vary greatly in the amount of evidence available, in the simplicity or sophistication of the methods employed, and in the amount they have to teach to others. Interestingly, when we checked the complete cases with experienced people, there was wide agreement that the 'thin' cases (in terms of the spareness of data available and the crudeness of the method used) were often the most instructive, because educators in other countries could most readily identify their own situation with them.

These cases, it should be emphasized, are not offered as models to be emulated. In fact in no few instances the chief lessons are, in a sense, negative ones; the greatest value lies perhaps in the analysis of the shortcomings of the methods used and in the suggestions of alternative methods that *might* have been used. But above all, the cases lend an air of reality to the whole subject. They demonstrate to the hard-pressed and hard-headed administrator who has grown sceptical of abstract theorizing that his colleagues elsewhere, with problems rather similar to his own, have actually made a stab at cost analysis with useful practical results. Hopefully such an administrator will browse through a few of these cases himself and be inspired to try a few stabs of his own.

P.H.C. AND J. H.

Paris, 1972.

Contents

19. Uganda: Educational cost evaluation
Nicholas Bennett 11

20. Uganda: Behaviour of non-teacher recurring expenditures
John Chesswas and Jacques Hallak 67

21. Uganda: The use of cost evaluation in the planning of Makerere University College
Nicholas Bennett 105

22. United Kingdom: The use of cost analysis to improve the efficiency of scholl building in England and Wales
Maureen Woodhall 147

23. Canada: Comprehensive analytical methods for planning in university systems—planning a new heath sciences education complex
Jack B. Levine, Richard W. Judy and Richard Wilson 179

24. Morocco: Costs of public secondary education—analysis of the results of a governmental survey
J. Proust 227

25. Chile: Improving efficiency in the utilization of teachers in technical education
Lucila Arrigazzi and José de Simone 271

26. USSR: Comparative costs and efficiency of full-time and part-time education
V. Zhamin and B. Remennikov 303

27. Hungary: Programming annual current and capital expenditures during the planning period
Lajos Faluvégi 315

Uganda

19

Educational cost evaluation

prepared by Nicholas Bennett

Mr. Nicholas Bennett of the IIEP was for four years working in the Manpower planning section of the Ministry of planning in Uganda. In this capacity he participated in the preparation of the Ugandan Educational Plan. In preparing the report he was greatly helped by the advice and comments of Mr. Philip H. Coombs, Director of Research at the IIEP. He also took advantage of the suggestions of other IIEP staff members, including Mr. John Chesswas, formerly officer in charge of planning in the Ugandan Ministry of education.

Introduction

This paper traces the preparation and the successive revisions of the educational section of the Uganda Second Five-year Plan (1966/67–1970/71), with major emphasis on the role played by cost analysis. It covers the period October 1964 to October 1968, during which time the author was working on educational and manpower planning problems in the Ministry of planning and economic development, Entebbe, Uganda.

Although this case-study concentrates entirely on the formal educational system under the responsibility of the Ministry of education, other parts of Uganda's educational and training effort were also covered in the planning process, using much the same techniques as those discussed here for the formal system.

One part of the educational system, however, was completely ignored, namely, private primary and secondary education. Even though the private system produces only a very small qualified output, and thus in manpower terms is of little importance, in enrolment terms the private schools do play an important role: private enrolments at the primary level being about 45 per cent of aided enrolments, and at secondary level about the same size as government-aided enrolments.[1]

There are many lessons to be learnt from both the successes and the inevitable mistakes of this Ugandan experience. It might be useful to note some of these right at the outset:

1. In projecting unit recurrent costs, as well as in taking account of the changing pupil/staff ratio and the changing nationality mix of the teaching force, it is important to take account also of the changing qualification and age structure (See Part I G).
2. In calculating the unit capital costs, it is necessary not only to prepare standard plans but also to survey existing educational establishments of the type being considered, in order to find out exactly how these establishments differ from the standard. Unit costs based on standard plans are useful with regard to new establishments that will conform to such plans; they are not as useful for the expansion of existing establishments that do not (Part I G).
3. In calculating unit capital costs, allowance should be made for regional differences in building costs rather than simply using the costs prevailing in the capital city (Part I G).
4. In a large programme a few projects should be costed thoroughly by experts to see whether the rough programme estimates have included all cost elements and are reasonably accurate (Part I G).
5. A plan should not place too great a dependence on foreign aid (Parts II, IV and V).

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[1] Private schools in Uganda are schools that are not aided by the government and do not belong to the recognized voluntary agencies.

6. There is always more than one way to achieve a specific goal, and there is nothing inherently sacred in the current educational arrangements in a country (Part III B).
7. Even with incomplete information and relatively crude techniques, useful guidance can be gained from exercises such as cost-benefit analysis, used in conjunction with other evidence (Part III D).
8. In preparing a plan it is very important to have alternative targets to cover differing eventualities (Part IV A).
9. The indirect and future recurrent costs of projects should not be ignored (Part IV A).
10. It should not be assumed that conclusions reached on the basis of cost-benefit studies or manpower projections will be accepted automatically by policy-makers. In many countries education is the most political of all government activities; thus in framing a plan due consideration must also be given to the social demand for education (Part V).
11. A plan does not become a useful tool for implementation unless full project information on all projects in particular programmes has been worked out, the *projects* checked for feasibility, and the necessary alterations made in the plans (Part V).
12. The time necessary for implementing projects must always be taken fully and realistically into account (Part V).

Educational planning in a developing country is not a theoretical exercise; it is extremely practical. It is a question of seeing what should be done, working out how to do it (despite the shortages of most essential resources) and planning that it should be done at least cost within the shortest possible time.

Educational planning that goes only as far as the programme stage, identifying in over-all terms the financial and other requirements of implementing specific goals, is of little value unless it is followed up by complete and thorough preparation of individual projects, revealing exactly what has to be done in specific institutions to fulfil the programme.

It is what happens that is important, not what is planned to happen.

I. First draft of the educational plan

A. The initial frame of reference for educational planning

Uganda has had a surprisingly long history of both educational and economic planning, the first attempt at any form of planning being in 1920. However, the Uganda Second Five-year Plan, the preparation of which we are discussing here, was the first real attempt at comprehensive planning.[1] All sectors of the economy, both public and private, were studied in some detail and their inter-relationships investigated.

Work on the over-all perspective plan (which was to cover the period July 1966 to June 1971) started early in 1964. A mathematical projection model was worked out and from this, combined with projections of existing policies and trends, a perspective plan was prepared.

In this perspective plan, population and GDP were projected to increase as follows:

TABLE 1. Population growth (millions)

1962	1966	1971	1976	1981
7.02	7.74	8.76	9.83	11.37
(2.5 % p.a. — 1971.		2.6 % p.a. — 1976.		2.7 % p.a. — 1981)

TABLE 2. Growth in GDP (million shs.)[1]

	1962	1966	1971	1976	1981
Monetary	2 140	2 840	4 480	6 560	9 700
Non-monetary	860	960	1 140	1 340	1 500
Total	3 000	3 800	5 620	7 900	11 200
Per capita (shs.)	430	490	640	800	980

1. The rates of exchange prevailing in late 1968 were: 1 Uganda shilling = $0.140 or £0.058 sterling.

The increase in monetary GDP was broken down by 10 broad sectors, and estimates made of the necessary investments for each sector. Ten corresponding working parties were then set up and given GDP target figures for 1971 and cumulative investment targets for the period 1966/67 to 1970/71. In the preliminary projection, the educational sector was assumed to contribute 240 million shs. to GDP in 1971 and to require a capital investment of 240 million shs. for the period 1966/67 to 1970/71.

In April, 1965, a Working Party on Education and Manpower was set up jointly by the Minister of education and the Director of planning, with the Chief education officer as Chairman and with members drawn from the Ministries of education, planning and labour, the University, the Teachers association, and the general public.

The Working Party was charged with preparing programmes for education and training, both formal and non-formal, for the period 1966/67 to 1970/71. It was also asked to consider participation-rate objectives, to examine the need to devise a plan for universal primary education, and to have regard for the educational aspirations of the people of Uganda. In short, its triple terms of reference included: (a) expenditure; (b) manpower projections and (c) social demand.

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[1] See Appendix C, *Work for Progress—Uganda's Second Five-year Plan*, Entebbe, Uganda, Government Printer, 1966.

A fact of cardinal importance for the Working Party was that, ever since independence in 1962, there had been a very rapid expansion in educational enrolments at all levels (see Appendix II). As a consequence, some of the most serious shortages of educated and skilled personnel were by 1966 already well on their way to being overcome. The task force concluded, therefore, that the broad front expansion of the past should be replaced by a more selective expansion policy. In this connexion, one of the main background documents given to the Education Working Party was the manpower projections from the 1962-64 high-level manpower survey. The following table summarizes the results of that survey:

TABLE 3. Manpower projections 1963–81, based on 1962–64 manpower survey (stock figures)

	Mid 1963 actual	Mid 1966 estimate	End 1971 projection	End 1976 projection	End 1981 projection
First level (a)	3 000	3 500	5 000	6 800	9 100
Second level (b)	7 300	8 600	15 000	23 300	36 000
C.S.C. (c)	5 000	5 200	8 100	12 900	19 900

(a) Posts requiring at least 16-17 years education (i.e. requiring a university degree or equivalent)
(b) Posts requiring at least 12 years education, but not a degree (i.e., Higher School Certificate)
(c) Posts requiring Cambridge School Certificate (C.S.C.)

B. Setting the enrolment targets

The first task of the Working Party was to set certain minimum enrolment targets. For secondary and higher education, the enrolments implied in the manpower projections were taken as the minimum goal. For primary education the minimum target was taken as the enrolment that would be achieved if there was no expansion of teacher output during the plan period, no increase in the number of unqualified teachers, and no change in the pupil/teacher ratio.[1]

As well as the stock figures shown in Table 3, the 1962–64 manpower survey also showed (a) flow figures based on the stock figures, (b) the various assumptions about wastage (complete Ugandanization by 1981, 3.5 per cent per annum wastage of Ugandans in post in 1963, 1 per cent per annum wastage of the increase in stock of Ugandans after 1963), and (c) the intake requirements for the next level of education.

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[1] Though primary education was constitutionally and administratively the responsibility of the local governments, it was possible for the central government to control *expansion* through the allocation of 'development teachers' and various grants.

Those flow figures are summarized in the following table.

TABLE 4. Gross requirements of high level manpower 1966–71 and 1972–76 (from 1962–64 manpower survey)

	Gross requirements 1966-71	Gross requirements 1972-76
First level	2 550	2 860
Second level	11 630	14 510
(of which H.S.C.) (a)	(5 960)	(7 530)
Third level C.S.C.	23 040	27 490

(a) Higher School Certificate, including low level scientific technicians.

From these gross requirement figures educational flow charts were constructed, starting with the university (first level), so that after allowance for drop-outs and failures, the gross requirements for the period 1966–71 would be met.

Those failing or dropping out from university were counted as a supply of second-level manpower, while failures and drop-outs at the second level were counted as third-level manpower.

In the flow charts the growth in intakes was kept as smooth as possible, bearing in mind that intakes at one level could not be expanded until the output from the lower level had grown sufficiently, and also taking care that the intakes and enrolments in 1971 were not so large that the gross requirements over the period 1972–76 would be exceeded unless intakes were cut.

These flow charts revealed that enrolments at the secondary level grades 8-11 (S.1–S.4) would have to grow from 15,400 in 1965 to 28,300 in 1971, enrolments in grades 12-13 (S.5–S.6) from 1,150 to 3,540, and enrolments of Ugandans in first-degree courses in the University of East Africa from 900 to 1,600.[1] Similar exercises were carried out for other parts of the secondary and higher education system, such as for commercial and technical education.

After a very cursory costing exercise it became evident that even to fulfil these minimum enrolment targets the original expenditure ceiling would have to be exceeded. The Working Party therefore set to work analysing the existing costs of educational establishments in order to discover the potential for cost reduction. This costing exercise was carried out for each of the main sectors of formal education under the responsibility of the Ministry of Education: primary; Grade II teacher training; technical and farm schools; secondary 1-4; senior secondary 5-6; Grade III teacher training; Grade V teacher training; Uganda Commercial College; Uganda Technical College; University;

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[1] S.1–S.4, secondary 1 to secondary 4 where the C.S.C. examination is taken. S.5–S.6, senior secondary 3 to senior secondary 6, where H.S.C. examination is taken.

C. The initial costing : recurrent costs

For all parts of the education system except the university, figures from the 1963–64 estimates of government recurrent expenditure were used (the Uganda financial year running from July to June), in conjunction with enrolment data for 1963 and 1964 (the educational statistics being taken in March of each year).

It was decided that it would be simpler to analyse the costs of secondary education from the revenue side than from the expenditure side.

Apart from fees, aided secondary schools are financed from four sources by the central government: (i) *block grants*[1]—basically to cover salaries of non-teaching administrative staff; (ii) *capitation grants* to cover other non-teaching expenses (with the fees); (iii) *teachers' salary payments*; (iv) *expatriation allowances*.[2]

The following table analyses these revenues on a per-pupil basis:

TABLE 5. Recurrent costs of secondary education 1963/64 (in Uganda shillings)

	Secondary 1-4		Senior secondary	
	Day	Boarding	Day	Boarding
Block grant (a)	72	72	96	96
Capitation	200	450	400	800
Teaching	1 064	1 064	1 166	1 166
Expatriation	426	426	466	466
Fees	340	500	340	500
Total	2 082 (b)	2 512	2 284 (b)	3 028
Average	2 290		2 710	

(a) Average figure negotiable between schools and Ministry

(b) Do not add up due to a transfer of fees from day schools to government. As most of the fees are transferred, these totals are still too high.

Two of the lines in table 5 are not in fact accurate the expatriation line and the fee line. Firstly, in the Uganda estimates the expatriation allowances (air fares, gratuities, education allowances) do not appear under the Ministry of education but under a central vote included with all other expatriation allowances in other ministries (doctors, engineers, agricultural officers, etc.). It was found to be virtually impossible to separate out the expatriation allowances for teachers from the total. However, it was calculated that in over-all terms the expatriation allowances increased costs by 40 per cent of the basic salary. This figure was thus applied to teachers' salaries also. (It was assumed that in 1963/64 100 per cent of secondary teachers were expatriates.) Secondly, in Uganda there are no fixed rules about how much a school should charge in fees, and at the time the Working Party was sitting there was no complete information. However, judging from the information that existed, the range did not seem to be wide. For day schools, they tended to cluster around 340 shs. per annum, and for boarding schools around 500 shs. per annum.

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[1] In 1966 a new item of the grant to secondary schools was introduced to cover the increase of 25 per cent in minimum wages legislated that year. This grant was simply 25 per cent of the salaries of unskilled and semi-skilled workers at the particular school.

[2] See Appendix IV.

The unit costs of other parts of the formal secondary and primary system were worked out in much the same way, the main difference being that in primary[1] and vocational schools and teacher-training colleges Ugandan teachers formed a significant proportion of the total, and thus the salaries of Ugandan and expatriate teachers had to be separated out and only that part attributable to the expatriates grossed up by 40 per cent.

TABLE 6. Financing of primary and second-level education, 1963/64

	Block and capitation	Teacher payments	Fees	Total
Primary	—	140	30	170
Technical and Farm	1 000	1 320	450	2 770
Grade II teacher training	776	1 228	200	2 204
Grade III teacher training	2 746	3 200	—	5 946

The annual per-student costs of the four high-level institutions (Makerere University College, Uganda Technical College, Uganda Commercial College and Grade V Teacher Training) were worked out by analysing the accounts of the particular establishments.

The most complete analysis was done for Makerere University College, where the actual expenditure was analysed functionally by department for 1961/62, 1962/63 and 1963/64, and the estimates for 1964/65 and 1965/66 were analysed in the same way. Those calculations showed that the cost per student had not been falling, even though student numbers had been rising, and in 1965/66 stood at almost 20,000 shs. per student per year.[2]

A similar but less complete costing exercise was carried out for the Uganda Commercial College and the Uganda Technical College. As both these colleges were carrying out many different courses at different levels, and as their functions had changed rapidly during the previous few years, no figures useful for planning purposes could be obtained.

The other section of the formal educational system for which it was not possible to get useful figures was the Grade V Teacher-training College, which had only just started.

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[1] See Appendix IV.

[2] See 'Uganda: the use of cost evaluation in the planning of Makerere University College', on page 107 of this volume.

D. The initial costing : capital costs

In 1964 a committee had been set up within the Ministry of education to prepare uniform building standards for secondary schools, on the basis of which standard plans had been drawn up and costed.[1] The Working Party assumed that these capital cost figures per pupil could be applied to all secondary schools, Grade II (four years' training after primary school) and Grade III (two years' training after C.S.C.) teacher-training colleges, and technical and farm schools. No attempt was made to cost boarding and day establishments separately, or to cost the special requirements of such specialized institutions as the technical and farm schools.

For primary education it was calculated that a classroom in semi-permanent materials could be constructed for about 12,000 shs. With forty pupils per class this would involve an expenditure of 300 shs. per pupil. (For each new approved Grade III teacher position, the central government made a capital grant to the local authority of 8,000 shs. to 12,000 shs., theoretically for the construction of a better house for the higher-quality teacher, but it was almost always used to cover the cash component of constructing the house and classroom.) Though the Working Party assumed a capital expenditure of 300 shs. per new pupil, it was realized that this was probably an under-estimate at that time in real terms, firstly because the average class size was less than forty per class and secondly because parents generally donated money themselves and provided free labour, thus usually making it possible to construct both a classroom *and* a teacher's house from the grant received.

For the Uganda Technical College a capital development plan had already been prepared and costed by architects. For the Uganda Commercial College and Grade V Teacher-training College rough estimates were made of the approximate per-pupil place costs of expansion. For Makerere, though the historic cost was 100,000 shs. per place, it was estimated that future expansion would require only 17,000 shs. per place for residence facilities and 18,000 shs. for teaching facilities, on the assumption that existing facilities could be used more intensively. No allowance was made for new staff housing, as it was felt that there was already an adequate stock of houses for the expansion envisaged.

E. The initial costing : summary

From these unit cost figures (1963/64 for recurrent costs and 1964/65 for capital costs) and from the minimum enrolment figures described in section B above, the aggregate capital and recurrent requirements of the formal education system could be calculated. These are shown in the following tables:

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[1] See Appendix B of J. D. Chesswas, 'Educational planning and development in Uganda', in *Educational development in Africa*, Vol. I, Paris, Unesco: IIEP, 1969.

TABLE 7. Initial recurrent costing of education for 1971 based on 1963/64 costs (including fees) and minimum enrolment figures (in Uganda shillings)

	Total enrolment 1971	1963/64 recurrent cost per place	Total recurrent cost 1971
Primary	720 080	170	122 413 600
S.1–S.4	28 330	2 290	64 875 700
S.5–S.6	3 540	2 710	9 593 400
T.T. II	3 500	2 200	7 700 000
T.T. III	1 780	5 950	10 591 000
T.T. V	500	20 000	10 000 000
Technical and Farm	3 570	2 750	9 817 500
U.T.C.	300	10 000	3 000 000
U.C.C.	500	7 000	3 500 000
University of East Africa	1 610	20 000[1]	32 200 000
Scholarships	—	—	15 240 000
Total			288 931 200

[1] The Working Party omitted to take account of allowances paid to Ugandan students of approximately 2,500 shs. per student per year.

TABLE 8. Initial capital costing (in Ugandan shillings): 1966/67 to 1970/71 based on 1964/65 costs and minimum enrolment figures

	Per capita costs 1963/64 prices	Extra places 1966–71	Total cost
Primary	300	142 800	42 840 000
S.1–S.4	11 000	9 440	103 840 000
S.5–S.6	11 000	1 880	20 680 000
T.T. II	11 000	2 200	24 200 000
T.T. III	11 000	1 200	13 200 000
T.T. V	20 000	220	4 400 000
Technical and Farm	11 000	1 360	14 960 000
U.T.C.	51 900	140	7 266 000
U.C.C.	30 900	350	10 815 000
University	35 000	670	23 450 000
Total			265 651 000

This preliminary costing exercise made it clear that even with very limited objectives (fulfilling only the manpower projections, and holding the percentage of children in primary school roughly constant) both the recurrent and capital costs would be higher than those allowed for in the perspective plan. Moreover, these cost estimates did not include non-formal education, private schools, or educational establishments outside the control of the Ministry of education, whilst these were embraced in the perspective plan targets.

It was evident, therefore, that proposals would have to be made to reduce the unit costs, especially since enrolments had already been fixed at the minimum possible level.

The Working Party felt, more or less intuitively, that capital expenditure on formal education could be reduced to something like 160 million shs. (compared to the target of 240 million shs. in the perspective plan) and that recurrent expenditure, which was more difficult to cut, could be pared to 240 million shs. (equal to the target figure for the whole of education in the perspective plan).

F. Initial proposals for reducing costs

1. *Recurrent costs*

There appeared to be little possibility of reducing the recurrent costs of *primary education*, since there were two counteracting forces which would tend to keep the per-pupil costs constant. On the one hand the proportion of higher-qualified (and thus higher-paid) teachers would increase, but on the other hand, supernumerary headmasters in primary schools were being abolished and each primary school would only have one teacher for one class, thus raising the pupil/teacher ratio from its 1963/64 level of 35:1 to about 40:1 by 1971.

The Working Party anticipated that the per-pupil recurrent costs of *secondary education* were likely to fall from their 1963/64 level quite considerably by 1971, mainly because the proportion of expatriate teachers was expected to decline from almost 100 per cent in 1963/64 to about 50 per cent in 1971. Thus in 1971 only half the teacher salaries would need to be grossed up by 40 per cent for expatriation payments. The over-all effect, it was estimated, would be to lower per-pupil instructional costs in 1971 by 15.2 per cent at the S.1–S.4 level and 16.7 per cent at the S.5–S.6 level. A counteracting factor, however, was an expected increase in the proportion of boarding-school places, from just over 50 per cent in 1963/64 to about 70 per cent in 1971. This, it was estimated, would raise non-teaching costs (capitation and block grants, and fees) by 14.5 per cent for S.1–S.4 and 13.2 per cent for S.5–S.6.

The combined effect of all the foregoing changes, it was estimated, would be to reduce total recurrent costs per pupil for S.1–S.4 from 2,290 shs. per annum to 2,180 shs. per annum, and for S.5–S.6 from 2,710 shs. to 2,580 shs., a reduction of 4.8 per cent in both cases. But this reduction was considered to be entirely insufficient to match resource scarcities; hence two cost-reducing proposals were made by the Working Party.

The first concerned class size. Because of under-enrolment in many S.1–S.4 classes, the pupil/teacher ratio in 1963/64 was only 18.4 to 1 as against the established norm of 20 to 1. Thus it was recommended that teachers be allocated to schools not as at present on the basis of the *number of classes* in each school but on the basis of the *number of pupils*. It was further recommended that in order to raise the average class size in S.1–S.4 to the established norm of 35, the intake be increased to 38 per class.

The second proposal involved a change in the academic calendar. Because of the high proportion of expatriate teachers (each taking three months' leave every two years) the establishment in secondary schools had to be almost 10 per cent higher than would be the case if all the teachers were local. It was therefore recommended that the long holiday in secondary schools be changed from December-January to July-August and that all expatriate teachers be flown back to their countries (mainly the United Kingdom) by charter flights for seven weeks during this period. In this way no teaching time would be lost through overseas leave and the establishment could be cut by about 10 per cent. Thus only 1.5 teachers per class of 35 students would be required (instead of the 13 or 14 teachers for eight classes in the past), giving a pupil/teacher ratio of 23.3:1.

It was estimated that, taking all the above factors into consideration, average per-pupil recurrent costs could be slightly reduced, as shown in Table 9 below.

TABLE 9. Change in secondary per-pupil costs 1966–71 as estimated by Working Party

	1966	1967	1968	1969	1970	1971
S.1–S.4	2 080	2 086	2 065	2 052	2 034	2 018
S.5–S.6	2 459	2 441	2 423	2 406	2 388	2 370

If all the recommendations had been implemented the reduction in costs would in fact have been more than that shown by the Working Party, for reasons that will be explained later (Part I G).

The same type of exercise was carried out for Grade II and Grade III teacher-training colleges, and for farm schools. It was further recommended in these cases that non-teaching costs of institutions similar in type and level to S.1–S.4 and S.5–S.6 should be fixed at the level for secondary schools. Thus, for example, non-teacher costs per student of Grade III teacher training should be reduced to those in S.5–S.6 and the boarding costs per student in farm schools reduced to those in S.1–S.4.

A more drastic recommendation was that technical schools be run on a 'sandwich' basis, with students alternating between six months in school and six months as apprentices in industry. In this manner much, it was argued, of the necessary practical experience could be gained in industry while the technical schools concentrated on theory and general education. The economic advantage would be that two alternating groups of students could use the same college in any given year. To be sure, more staff would be required, thus raising the recurrent cost *per place per year*, but the recurrent cost *per pupil per year* would nevertheless fall.

In summary, it was estimated that Grade II teacher training per-pupil costs could be reduced from 2,204 shs. per annum in 1964 to 1,897 shs. per annum in 1971, Grade III from 5,946 shs. per annum to 4,216 shs. per annum, technical schools from 2,750 shs. per pupil per annum to 1,926 shs., and farm schools from 2,750 shs. to 2,546 shs. per annum.

The working party members were convinced that post-secondary education costs were much higher than was necessary, particularly at the University of East

Africa, but it was difficult to make definitive recommendations for reducing them because the recurrent financing of the University was fixed only indirectly by the three co-operating governments.[1] Nevertheless the Working Party did make suggestions for cost reductions in the Makerere University College in Uganda (a component of the University of East Africa) along two main lines: (i) that most administrative and other overhead costs remain fixed while the number of students increased by almost 60 per cent and that such items as library and departmental non-teaching costs be held to an increase of only 35 per cent; (ii) that student/staff ratios be increased to internationally accepted norms. The first proposals would cut per-pupil recurrent costs by an estimated 2,000 shs. per annum in 1971 and the second by approximately 4,100 shs. In combination, they might reduce the over-all cost per student from its 1963/64 level of 20,000 shs. per annum to 14,000 shs. by 1971. In all these calculations, the Working Party took no account of bursaries (scholarship payments to students) which would add 2,500 shs. to the pupil cost in both years.

Other institutions of higher education, it was recommended, should reduce their per-pupil costs to those of the nearest equivalent faculty at Makerere. Thus, for example, the Grade V Teacher-training college should reduce its recurrent cost per pupil to the level recommended for the Faculty of education, while the per-pupil costs of the higher courses at the Uganda Commercial College should be reduced to the level recommended for the Faculty of social science.

Over-all, it was estimated that the foregoing proposals would reduce recurrent costs of education from the initial estimate of 292,956,200 shs. for 1971 to 257,131,75[illegible] shs., a cut of 35,824,449 shs., or 12.2 per cent. (Actually the Working Party thought at the time that they had reduced costs from 288,931,200 shs. to 259,007,394 shs., a reduction of 29,923,806 shs. or only 10.4 per cent, because they had neglected to take account of (a) the bursaries given to students at the university and (b) the lower qualification structure of the teaching force in secondary schools in 1971, see Part I G).

But even this reduced figure substantially exceeded the 240 million shs. tentatively allocated in the perspective plan for the recurrent costs of education in 1971. Thus more radical methods of cost cutting would have to be considered.

2. *Capital costs*

Many of the capital cost reductions proposed by the Working Party followed logically from the recurrent cost reductions just discussed.

In primary education no reduction in capital cost was thought feasible. If any change were to take place it would more likely be in an upward direction, since the community effort had not been fully costed and there might be pressures on government to take on a greater share of the burden. But on the other hand, the scarcity of development resources was such, both for the central and the local governments, that no increase seemed feasible.

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[1] The University of East Africa serves, and is jointly financed by, Uganda, Kenya and Tanzania. It is financed on a triennial basis through a University Grants Committee, made up of government representatives and outside academics.

As for secondary education, the increase in pupil/staff ratio would automatically decrease the number of staff houses needed. The Working Party further recommended that all boarding-school dining-rooms be used on a double shift basis, and that all dormitories be built to take double bunks. With regard to S.5–S.6 there was currently considerable excess capacity because of a recent policy decision to increase class size from 20 to 30; hence this would reduce the amount of new space required to handle increased enrolments. Taking all the above points into account, the Working Party estimated that during the period 1966-71, the average capital cost per place was likely to fall from its 1964/65 level of 11,000 shs. per place to 9,000 shs. for S.1–S.4, and from *11,000 shs.* to *7,000 shs.* for S.5 to S.6.

Similar recommendations were made with respect to Grade II and Grade III teacher training as for S.1–S.4 education. However, since it was important that special consideration be given to Grade III teachers, the Working Party conceded that student residence facilities in Grade III colleges should be somewhat more generous than in secondary schools.

For farm schools the recommendations on boarding and catering facilities made for secondary schools were repeated. Beyond this, the recommendation noted earlier that technical schools be run on a sandwich basis meant that the number of students attending existing schools could be doubled at virtually no capital cost. Thus, it was assumed that no capital expenditure would be required for technical schools.

Since there was to be only one Grade V teacher-training college, its capital costs had to be estimated by a separate project analysis of needed facilities. The existing Grade V teacher-training college had already taken over facilities previously used by a primary teacher-training college, and so much of the teaching space required was already available. In addition, some students' hostel places were being constructed with USAID assistance. Thus, all that seemed to be needed were some additional hostel places and certain specialized teaching facilities (science laboratories, design workshops, etc.).

The capital proposals presented by the Uganda Commercial College and the Uganda Technical College were thought to be excessive. For example, the college of commerce's proposal would have involved demolishing all the buildings on the site (worth at least 4 million shs.). However, since the future role of these institutions had not yet been finally decided, the Working Party made no recommendations with respect to them.

Substantial capital savings also seemed possible at the University. For one thing, the sizeable increase recommended in the student/staff ratio would mean a considerable cut in the staff offices and teaching accommodations required to serve more students. For another, there was considerable possibility for doubling-up in the halls of residence. When these two factors were costed, it appeared that the capital costs could be reduced from 35,000 shs. per place to 14,400 shs. per place.

In summary, with respect to capital costs, the Working Party recommended reducing the preliminary total estimate of 265,651,000 shs. (at 1964/65 costs) to

200,791,200 shs.—a reduction of 64,859,800 shs., or 19.2 per cent, compared with the target of 240 million shs. in the draft perspective plan.

The Working Party members had serious doubts, however, based on past experience, as to whether even this reduced capital programme could be financed or built in time. Their guess was that no more than 160 million shs. could be available.

G. Commentary on costing factors and methods

Thus, despite substantial cost-reducing recommendations, the estimated totals for both the recurrent and capital costs were still too high. The Working Party accordingly turned its attention to more radical cost-reducing methods, which will be discussed later.

It should be noted, however, that not surprisingly, various minor errors were made by the Working Party in its costing exercise. These are discussed below.

1. *Recurrent costs*

Though it was realized that the composition of the teaching force would probably change between 1963 and 1971, the Working Party took no account of the effect that this would have on average basic salaries (other than the allowance made for the decline in the proportion of expatriate teachers).

In the case of secondary schools, many new teachers would be entering, and so the average age and experience of the teaching force would tend to fall, bringing about a decline in the average basic salary. (It was assumed that there would be no change in the salary scales.) This decline would be made greater still by the influx of (free or low-cost) expatriate volunteers and by the increasing proportion of Grade V teachers as against university graduates. The net effect of all these factors would be to reduce the Working Party's estimate by more than 14 per cent. The absolute amounts are shown in the table below.

TABLE 10. Basic salary per teacher, 1963–71

Year	Actual 1963-64	Actual 1965	Actual 1966	Actual 1967	Est. 1971
Average basic salary	19 651	18 394	18 549	18 544	16 925[1]
Cost per pupil	1 068	981	946	892	726[1]

NOTE The Working Party assumed that the 1963/64 average basic salary would hold throughout the period.

[1] When the rate of expansion of the system slows down both the average basic salary and the cost per pupil will tend to increase.

Another error was made in calculating the per-pupil teacher costs, which took no account of the fact that the pupil/teacher ratio was well below the approved norm in 1963/64 (18.4:1 instead of 20:1 for S.1–S.4). The savings calculated were based on increasing the ratio in S.1–S.4 from 20:1 to 23.3:1, not from 18.4:1 to 23.3:1, which would have made a 20 per cent increase in the pupil/teacher ratio instead of the 14 per cent used.

The effect of the above two errors was to over-estimate S.1–S.4 per-pupil costs by about 180 shs., making a total over-estimate in projected secondary education costs of over 5 million shs., or about 9 per cent.

A similar error was made for both primary and university education in failing to calculate the effects on unit costs of a proposed change in the teacher qualification structure.

In primary schools the proportion of Grade III teachers and Grade II teachers was expected to increase, while the proportion of Grade I and unqualified teachers would decrease. Despite the cost-increasing effect this would have, the Working Party estimated that average per-pupil teacher cost would remain constant, due to the offsetting reductions from an increase in the pupil/staff ratios. By July 1968, however, it had become apparent that these ratios were not increasing as expected and that per-pupil teacher cost had already increased by 10 shs., or 7 per cent. But since enrolment was correspondingly lower than planned, total expenditure was running at approximately the planned level.

At the university level the Working Party had recommended that the ratios of professors/senior lecturers and readers/lecturers be changed from the 1964/65 levels of 1:1.7:3.4 to 1:1:4, but no account was taken of this change in the cost calculations. (By July 1968 it appeared that the ratio was not changing as recommended.)

The other main error in the recurrent cost calculations was the omission of the cost of bursaries given to students at the University for their personal expenditure.

The aggregate effect of these various errors was to over-estimate total recurrent costs for education in 1971 (as recommended by the Working Party) by 2 million shs. out of 257 million shs., or less than 1 per cent.

2. *Capital costs*

The capital costing exercise carried out by the Working Party was on the whole much weaker and less comprehensive than its recurrent costing exercise. One major weakness, which resulted in a substantial under-estimate of capital costs, was the failure to take account of the regional differences in building costs—which in Uganda are quite considerable, as was discovered in a later exercise whose results are shown in table 11.

A second major source of error was the lack of any studies of the under-utilization of existing school space (which proved to be substantial) and of the actual expansion needs of existing schools. Moreover, although fixed standards were worked out and costed for various types of institutions, no study was made of how much existing institutions deviated from these standards (all expansion was to take place in existing institutions) or of what facilities would be required, or of what schools should be brought up to standard. The net effect of these particular weaknesses was a quite substantial over-estimate of capital requirements.

TABLE 11. Index of regional price differentials in building costs (Kampala = 100). (The index affects total capital costs, including fees).

Location	Index	Miles from Kampala
Arua	135	318
Kubale	135	258
Sebei	135	206
Fort Portal	130	198
Moroto	125	300
Gulu	125	212
Hoima	125	125
Soroti	110	223
Masaha	110	81
Mbale	105	159
Kampala	100	0
Jinja	95	50

If one assumed that each new place in an existing secondary school would cost the same as in a new secondary school (i.e., there were no savings due to the increases being marginal), if one took account of the regional distribution and the distribution between day and boarding schools, and if one took account of the site supervision expenses and fees, the *plan* actually involved a cost per place S.1–S.4 of approximately 16,000 shs. and a cost S.5–S.6 of approximately 18,000 shs., instead of the basic standard cost of 11,000 shs. used by the Working Party.

From these figures there are obviously considerable potential savings; firstly because all the expansion planned was at existing schools, and thus though the expansion was by no means small, many overheads might not be required; and secondly because in many existing schools there was not complete utilization of existing facilities, i.e. dining-halls could be used on a two-shift basis, double bunks put in existing dormitories, the home classroom principle abolished, etc.

It was impossible, of course, to make any estimate of how much each extra place would cost without carrying out a complete analysis of existing secondary school facilities. But it is interesting to note what actually happened.

By 1968 the enrolment in secondary schools S.1–S.4 had already grown to 28,130 (compared with the projected increase to 28,330 by *1971* in the original Working Party report)—an increase of 9,339 in two years compared with the projected increase of 9,439 over five years. And yet, during the financial years 1966–67 and 1967–68 only about 8 million shs. of development (i.e. capital) expenditure was made on secondary schools. Quite obviously the originally planned standards had not been applied, and the proportion of boarders planned had not been achieved. Instead, various expedients of a purely temporary nature had been adopted, involving very little capital outlay. Nevertheless the above figures do show that there was, in 1966, a considerable amount of excess capacity in secondary schools which was not taken into account by the Working Party.

The same shortcomings applied in estimating capital funds needed by other sectors of the educational system, resulting in an under-estimate due to the omission of regional weightings, but a larger over-estimate due to the fact that surplus capacity at existing institutions was not always allowed for.

The clear lesson is that in order to achieve reliable capital estimates for an educational plan, particularly where most of the expansion in enrolments is to take place in existing institutions and where there are wide geographic variations in construction costs, the costing must be based on school-by-school project studies.

II. Testing the feasibility of the over-all draft plan

The draft educational plan prepared by the Working Party was internally consistent so far as student flows and teacher supplies were concerned. The planned output from each level of the system was sufficient to support the planned inputs at the next level for any given year, and the expected supply of teachers was in balance with the anticipated requirements. However, since the capital aspects had not been worked out in full project detail, there was no way of checking its physical feasibility—to know how many more students could be accomodated in present facilities and whether needed additional facilities could in fact be constructed in time to take the increased enrolments planned. Despite the lack of such information, however, it was possible to say, since no dramatic expansion of enrolments was planned for the first two years of the period, that the plan as proposed appeared physically feasible. It must be said, though, that there was a somewhat unrealistic bunching of capital investment into the early years of the plan (70 per cent in the first three years), but it was felt that this was likely to smooth itself out through delays in implementation without seriously delaying the expansion of enrolments.

The educational plan was but a part of an over-all economic and social development plan, and the over-all plan had to be checked for feasibility against a number of criteria. Would the probable foreign aid inflows and local resources be sufficient to finance the government's over-all capital development programme? Would government tax receipts and other revenues be sufficient to finance total government expenditure? Was the country's external account likely to be in balance? Was the capacity of the construction industry sufficient to carry out all the building planned? Would sufficient specialized manpower be available for all purposes?

The report of the Working Party on education and manpower, (with its estimated capital expenditure over the plan period of 160 million shillings, and recurrent expenditure in 1971 of 240 million shillings) was combined with the reports of the other nine working parties by technicians in the Ministry of planning into a draft over-all plan, which was then checked for feasibility in the ways mentioned above.

The draft outline plan

GDP was calculated to grow at an annual rate of 8.5 per cent (at factor cost in constant prices) during the plan period 1966/67 to 1970/71 (compared with only 5.2 per cent for the previous five years), with a monetary GDP growth rate of 9.7 per cent.

To support this growth in GDP a gross fixed capital formation of 5,200 million shillings for the five-year period was shown to be required, compared with an estimated achievement of 2,664 million during the previous five years. The following table shows the breakdown of the projected gross fixed capital formation.

TABLE 12. Uganda draft Second Five-year Plan—gross fixed capital formation

	1961-65 million shs.	1966-71 million shs.	1961-65 % of total	1966-71 % of total	$\frac{1966\text{-}71}{1961\text{-}65}$
Government investment	1 004	1 800	37.7	34.6	173
of which:					
Production	218	376	8.2	7.2	172
Education	136	160	5.1	3.1	118
Enterprise investment	1 160	2 400	43.5	46.1	207
of which:					
Parastatal	560	1 300	21.0	25.0	232
Replacement	200	400	7.5	7.7	200
Stocks increase	300	600	11.3	11.6	200
Subsistence	—	—	—	—	—
Total	2 664	5 200	100.0	100.0	195

It can be seen from this table (1) that the main effort of capital formation was expected to come from those parts of the economy not directly under government control, (2) that the rate of capital investment in education was not expected to increase greatly (this was partly due to the fact that the Education Working Party was perhaps more conscious of practical constraints and of the necessity for cost reduction than other working parties), and (3) that the central government was not able to concentrate much of its investment on productive activities.

Government capital formation

Table 13 shows the financing of government capital formation.

A high proportion of capital financing was expected to come in the form of foreign loans and grants, 55.5 per cent during the second plan compared with

TABLE 13. Financing of government's capital formation (shs. millions and percentage)

	1961-65	1966-71	Percentage distribution 1961-65	Percentage distribution 1966-71
Government investment	1 004	1 800	100.0	100.0
Sources:				
Budget	440	600	43.6	33.4
Internal borrowing	114	200	11.4	11.1
Foreign grants	104	100	10.4	5.5
Foreign loans	286	900	34.6	50.0

only 45 per cent during the first plan. Over 600 million shillings of this was already in the pipeline (loans and grants already negotiated or being negotiated). This did not mean, however, that 60 per cent of Uganda's over-all aid requirements were already visible at the time of preparing the draft outline plan, since in addition to the government's own requirements, another 400 million shillings of parastatal investment and 600 million of private investment was expected to come from foreign sources. Thus only 30 per cent of the total required foreign financing was in sight in August 1965. Considering the delays inherent in foreign aid negotiation, it was perhaps somewhat optimistic to assume that the other 70 per cent would be found in time.

As far as the educational plan was concerned, aid was already in the pipeline for two of the major programmes: secondary schools and the university.

Recurrent expenditure

Government recurrent expenditure was estimated to grow from 826 million shillings in 1965/66 to 1,200 million shillings in 1970/71—a growth of 7.8 per cent per annum. This was obviously an underestimate. Adding up the minimum recurrent expenditures recommended in the Working Party reports, it would appear that recurrent expenditure would increase in total to 1,2[illegible] million shillings in 1970/71, not to 1,200 million shillings as shown in the draft outline plan.

Taxation

In a plan where both taxation and savings are expected to increase rapidly, it is important to investigate the burden on different sections of the community to check whether any particular section is expected to restrain its consumption unduly. The following table shows the average rates of taxation, investment and consumption assumed in the draft outline plan, for incomes earned in small-scale agriculture, from employment and from profits (surpluses of private and parastatal enterprises).

TABLE 14. Rates of taxation, investment and consumption, actual 1964 and planned 1971 (monetary economy)

	1964			1971			1971/1964			
	Tax	Inv.	Consum.	Tax	Inv.	Consum.	Inc.	Tax	Inv.	Consum.
Over-all	0.165	0.052	0.783	0.205	0.127	0.668	1.95	2.43	4.79	1.66
Agriculture	0.082	0.038	0.880	0.100	0.057	0.843	1.33	1.63	2.00	1.28
Employment	0.100	0.018	0.882	0.120	0.020	0.860	1.89	2.27	2.13	1.83
Surpluses	0.347	0.108	0.545	0.334	0.251	0.415	2.84	2.73	6.58	2.16

NOTE From another table in the draft outline one gets different results for 1971: Rate of taxation: Over-all 0.23, Agriculture 0.28, Employment 0.23, Surpluses 0.22.

Two major points are apparent from the above table. Firstly a very large proportion of the increase in tax revenue and savings was expected to come from the surpluses of the private and parastatal sector, consumption in 1971 being only 41.5 per cent of the income of those sectors. Secondly the rate of taxation on small-scale agriculture was very high (including export taxes of over 20 per cent omitted from the above table). This was more than double the rate to be borne by the higher income employees.

Construction

A very large proportion of the capital expenditure on any educational plan (over 80 per cent) usually goes towards the construction and equipping of buildings. Thus it is important to analyse the capacity of the construction industry.

In the draft outline plan it was estimated that the total construction expenditure on social services during the plan period was to be 600 million shillings, rising from 44 million shillings in 1966 to 120 million shillings. Obviously from those figures one cannot get 600 million shillings. Thus the global output of the construction industry should have been some 40 million shillings higher than shown in 1971, with consequent chain effects throughout the other tables.

Conclusions on the feasibility of the Draft Plan

Though many of the tables in the draft outline plan were not in fact consistent with one another, a really serious effort was made to map out the inter-relationships and over-all implications of the ten working party reports.

A very high rate of growth was being aimed for, and since much of the productive capacity of the economy was outside the direct control of the government, this meant that much of this growth would have to be outside government's direct control. However, because a large proportion of the government's revenue from taxation was to come directly and indirectly from the private sector to support the government part of the plan, this placed a premium on making sure that the private sector part of the plan was effectively implemented.

Even though a low capital-output ratio was involved, because of the extremely high rates of growth aimed for, high marginal rates of saving and taxation were needed, as well as a very large inflow of foreign financial assistance.

In preparing the plan, the difficulty of implementing a government development programme which depended heavily on foreign resources was not fully appreciated. Since foreign resources represented 55 per cent of the total required, this meant in effect that virtually every large project, if it was to be implemented, had to be at least partially supported by some foreign donor. This was because most such donors confine their support largely to the direct import content of a project, which in the case of the government development programme did not exceed 40 per cent of the total programme (and of the educational programme, less than 25 per cent).

The government recurrent expenditure estimates were lower than those shown in the Working Party reports for 1971 by 3.5 per cent, and though perhaps it is reasonable to assume some under-implementation of the plan, such underimplementation should have been posited as a second alternative, with a separate and consistent set of tables. Although one does not expect to find definite tax proposals at this stage of planning, some of the government revenue estimates did seem to be somewhat optimistic, particularly the revenue estimates for proceeds from import duties (given the extraordinarily slow rate of growth of consumer goods imports in the balance of payments projections). From the draft outline plan it would not appear likely that the indicated recurrent budget surplus would in fact appear.

Taking all the foregoing points into account, one can conclude that, although many relationships had not been fully and consistently investigated, the draft outline plan was *theoretically* a feasible plan, but since a large proportion of the effort was to come from parts of the economy over which the government had little direct control, the plan in practice was not likely to be fully implemented.

It only remains to be said that the Uganda government realized that there were many flaws in the original draft plan. In the revised published version of the plan, the growth target was reduced from 8.5 per cent per annum to 6.3 per cent, the gross capital formation from 5,200 million shillings to 4,600 million, and the estimated recurrent expenditure in 1970/71 was increased from 1,200 million shillings to 1,260 million.

III. New proposals for educational expansion and cost reductions

A. The government's reactions and conventional proposals

The government concluded, after studying the Report of the Working Party on Education and Manpower, that not enough attention had been paid to the social demand for education and to the progression of children from one level of education to the next. The Working Party was thus instructed to reconvene and produce a supplementary report on the implications of: (1) aiming for universal and free primary education by 1976; (2) a 25 per cent increase in the originally planned intakes into S.1 and S.5; and (3) a 20 per cent increase in intakes into the university.

New educational flow charts were constructed which revealed substantial difficulties in terms of manpower balances. They showed that the flow of students at the lower levels would support little increase in intake physically in either S.5 or the university during the early years of the plan. Therefore to achieve the desired increase in intakes for the five-year period as a whole (25 per cent at S.5 and 20 per cent at the university) would require overshooting these targets substantially in the later years of the plan. But this would throw educational output out of balance with manpower requirements in these later years or thereafter.

University intakes could not increase until 1969 because of the shortage of S.6 leavers; thus the manpower supply-demand position would not be affected by increased graduates during the plan period, 1966–71. But obviously in the next plan period, 1972–76, there would be a surplus at this level (31 per cent) relative to the manpower requirements on which university intakes had originally been based.

At the secondary school level, the above-mentioned bunching of the increased intakes in the later years of the plan period would also produce troublesome impacts on the expected manpower supply-demand position. As will be seen in Table 15 there would be almost no output from secondary schools available for employment over the period 1966–71, but in the following period there would be a considerable surplus of S.6 leavers even with no increase in intakes beyond 1971 (an unlikely hypothesis).

Thus the combined effect of the proposals for increasing secondary and university intakes would be to intensify manpower shortages during the plan period 1966–71 and to produce troublesome surpluses during the period 1971–76, even with no further increase in intakes.

Apart from these manpower difficulties there was a serious problem of costs. At this stage the Working Party was interested only in determining the rough order of magnitude of the increase in capital and recurrent expenditures that would be required; a thorough and complete costing exercise was not therefore carried out, except for primary education which earlier had been dealt with only cursorily.

For secondary and higher education the earlier unit cost figures were taken as a base, then modified to allow for special factors involved in the further increase in enrolments, with the following results:

1. For S.1–S.4 the recurrent cost per pupil would be higher than in the Working Party Report, because the proportion of expatriate teachers would have to be higher. Capital costs would also rise disproportionately, because the potential economies from marginal increases (e.g. double bunks in dormitories, increased class size, double shifting in dining-halls, etc.) had already been fully exploited. The same conclusion applied to S.5 and S.6.

TABLE 15. Supply and demand position of C.S.C. and H.S.C. leavers 1966–76 in the revised plan

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Revised output with C.S.C.	1 571	1 920	2 583	3 717	4 079	5 733	5 887	6 020	6 152	6 284	6 284	
		↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘
Intake into second-level education		2 000	2 250	3 210	3 690	4 180	5 600	5 600	5 600	5 600	5 600	5 600
Surplus for employment		−429	−330	−627	−27	−1	+133	+287	+420	+552	+684	+684
Revised output of H.S.C.	410	434	769	877	1 055	1 342	1 817	2 117	2 117	2 117	2 117	
		↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘
Intake into first level education		466	522	757	872	1 042	1 093	1 133	1 133	1 133	1 133	1 133
Surplus for employment		−56	−88	+12	+5	−37	+249	+684	+984	984	984	984

NOTES
1. A large negative surplus for employment at the C.S.C. level from 1966-68 could be achieved by some institutions at the second level taking a substandard intake.
2. The figures after 1971 assume, which is unlikely, that there will be no expansion of C.S.C. or H.S.C. after 1971. If there is expansion the surpluses will be even greater.
3. The surpluses in the latter periods are not cancelled out by the shortfalls in the earlier periods, as sub-standard people will be recruited then, and they cannot just be discharged when the shortage is over.
4. The surplus for employment at the C.S.C. level direct from S. 4 according to the manpower projections and flow charts should be an average of 400 per annum over the period 1966-71 and 700 per annum over the period 1972-76. Similarly at the H.S.C. level direct from S.6 should be 300 per annum and 700 per annum respectively.

2. For secondary teacher training, it was found possible to get the required increase in output of the non-graduate teachers (Grade V) at no extra recurrent or capital cost, merely by changing the intake requirement for the Grade V from C.S.C. to H.S.C. and shortening the course from three to two years. In this way some of the anticipated future surplus of H.S.C. leavers was to be absorbed, and the output of Grade V teachers increased by 50 per cent at no extra cost.
3. At the university level the Working Party was instructed to concentrate much of the increased intakes on science and professional subjects. Since those faculties were the most expensive, it was not to be expected that the recurrent cost of the extra places would fall below 14,000 shillings per place per annum originally assumed by the Working Party, even though the university could not be considered to be working to full capacity.
4. Capital costs of the extra places were estimated to be considerably higher than originally assumed by the Working Party, again because most of the marginal economies had been exhausted.
5. The conclusions for primary education and primary teacher training are explained in detail later.

The following table shows the roughy estimated increase in capital costs over the plan period 1966–71 and in recurrent costs for 1971, resulting from the government's proposal to increase enrolments more rapidly.

TABLE 16. Revised capital and recurrent cost estimates

	Capital 1966/67 - 1970/71 000 shs.	Recurrent 1971 000 shs.
Original W.P. total	200 800	259 010
Extra primary	80 000	76 000
Extra S.1–S.4	77 202	17 500
Extra S.6	18 500	4 860
Extra university	21 800	10 160
Extra primary teacher training	19 800	11 800
Total extra	217 120	120 320
GRAND TOTAL	417 120	379 330
% extra	108 %	46 %

In short, the government's proposals implied a 108 per cent increase over the Working Party's original capital proposals and a 46 per cent increase in recurrent costs. It must be remembered that the figures used in the draft outline plan (which was checked for feasibility) were 160 million shs. capital and 240 million shs. recurrent. It is perhaps not surprising therefore that the Working Party now felt that these new figures, involving over 30 per cent of government recurrent expenditure going to formal education, were unrealistically high. It therefore set to work trying to find radical cost-reducing measures which would enable the increased intake to be achieved, but not at such a prohibitive cost.

B. More radical proposals to cut costs

Various proposals were worked out in attempting to find a method of reducing both recurrent and capital unit costs. Obviously all such proposals posed pedagogical problems and would thus have to be attempted on an experimental basis before a decision was taken about their implementation. Though the Working Party was conscious of this fact, in all calculations made for savings during the plan period 1966–71 it was assumed for tactical reasons that the schemes could be introduced immediately.

One obvious reason for high capital and recurrent costs per pupil at all levels of education was the under-utilization of both physical plant and teachers. Teaching rooms at secondary boarding schools in Uganda, for instance, were typically used about six hours a day, five days a week, for forty weeks of the year, or only 13.7 per cent of total time (twenty-four hours a day, 365 days a year). The teachers in secondary schools had only about eighteen hours a week classroom contact with pupils for forty weeks of the year (four weeks of which, at the beginning and end of each term and at examination time, required little preparation). Admittedly teachers were often underpaid, but assuming that they were given reasonable salaries, it was reasonable to suppose that they could work substantially longer hours.

The six-term school year

In order to increase the utilization of educational resources, the Working Party put forward various proposals for secondary education, the most radical of which was the six-term school year. The essence of this idea was to use each set of school buildings and teachers for two lots of pupils instead of one. In day schools this could easily be done by double day shifts, but in boarding schools the scope for saving was limited by the need for dormitory, feeding and other domestic facilities.

With the six-term scheme, buildings would be used for at least fifty weeks out of fifty-two, in four terms of eight weeks and two of nine weeks. Two sets of pupils would be in each school, each set having two eight-week and one nine-week term. One possible sequence is illustrated in the following table:

TABLE 17. Six-term scheme: possible sequence, 1966

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6	Holidays
8 weeks	8 weeks	8 weeks	8 weeks	9 weeks	9 weeks	2 weeks
3 Jan. - 26 Feb.	28 Feb. - 23 April	25 April - 18 June	20 June - 13 Aug.	15 Aug. - 15 Oct.	17 Oct. - 17 Dec.	18 Dec. - 2 Jan.
S.2A	S.1A	S.2A	S.1A	S.2A	S.1A	—
S.2B	S.1B	S.2B	S.1B	S.2B	S.1B	—
S.3A	S.4A	S.3A	S.4A	S.3A	S.4A	—
S.3B	S.4B	S.3B	S.4B	S.3B	S.4B	—
S.6A	S.5A	S.6A	S.5A	S.6A	S.5A	—
S.6B	S.5B	S.6B	S.5B	S.6B	S.5B	—

NOTE Other sequences are of course possible.

The obvious main difficulty of this scheme was the reduction of total teaching time. The twenty-five weeks in school totalled about one-third fewer days a year than normal. To compensate for this shortfall, it was proposed that the school day be lengthened by half an hour, that the school operate on Saturday mornings, that religious knowledge be taught on Sundays, and that art and other practical subjects be taught during the term and practised during vacations. Students would also have a certain amount of prescribed vacation work, which in the long run could perhaps be complemented with radio programmes.

Another problem would be teacher vacation time. Obviously one could not expect teachers to work fifty weeks of the year and have just two weeks' holiday, especially since they were accustomed to three months' work followed by something like a month's holiday. An example of how comparable leave time could be provided under the six-term school year is shown in the following table, without any additional staff to that shown by the Working Party for an ordinary school.

Under the arrangements shown in the table, each teacher would have a complete eight or nine-week term as main leave, plus a two-week holiday and the two weeks when the school is closed at the end of the year —roughly the same total vacation as previously.

TABLE 18. Teacher duty roster: Four-stream school S.1–S.4 (16 classes, 8 in attendance at any one time) 11 teachers plus headmaster[1]

Teacher	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6	Holiday
1	L	D	D	1/4L3/4D	D	D	L
2	L	D	D	1/4L3/4D	D	D	L
3	D	L	D	D	1/4L3/4D	D	L
4	D	L	D	D	1/4L3/4D	D	L
5	D	D	L	D	D	1/4L3/4D	L
6	D	D	L	D	D	1/4L3/4D	L
7	1/4L3/4D	D	D	L	D	D	L
8	1/4L3/4D	D	D	L	D	D	L
9	D	1/4L3/4D	D	D	L	D	L
10	D	1/4L3/4D	D	D	L	D	L
11	D	D	1/4L3/4D	D	D	L	L
12	D	D	1/4L3/4D	D	D	L	L

L = Leave   D = Duty

1. Such an organization of teacher holidays would however pose serious problems on the subject spread. If some subjects were not to remain untaught whilst certain teachers were on leave there would either have to be extra teachers, or the scheme could be applied only to large schools.

Obviously, however, it would be necessary for the teacher to work considerably harder than under the conventional system, even though he would be provided with more administrative assistance, particularly at the beginning and the end of each term. For this harder work, it was proposed that there should be a 25 per cent salary increase for teachers working under this new scheme. An alternative would be to increase the teacher establishment by 25 per cent, but this was considered less desirable because one of the reasons for proposing the six-term scheme was to utilize existing teachers more fully and also because employing extra teachers would require the construction of extra staff houses at considerable capital cost.

If applied everywhere, the six-term scheme would permit a doubling of enrolments in secondary schools, teacher-training colleges, technical and farm schools with only minimal capital expenditure. And since even with the proposed increase in intakes, no level or type of education would more than double its enrolments during the plan period, the prompt and universal application of the scheme could virtually eliminate the need for any capital expenditure at the secondary level, thereby saving some 200 million shillings.

The recurrent cost implications of this scheme for an ordinary S.1–S.4 boarding school are illustrated in the following table. It compares (as of 1965/66) the per-place costs (each place being occupied by two pupils) and the per-pupil costs for the same school operating under the conventional system or alternatively under the six-term scheme.

TABLE 19. Recurrent costs under the six-term system compared with conventional system

	Per-place costs 1965/66			Per-pupil costs 1965/66		
	Conventional (a)	Six T.S. (b)	% Difference (a) to (b)	Conventional (a)	Six T.S. (b)	% Difference (a) to (b)
Salaries of non-teaching staff and administration	157	345	+120	157	172	+ 9.5
Tuition materials etc.	145	290	+100	145	145	—
Boarding costs	499	674	+ 35[1]	499	337	−32.5
Maintenance	185	250	+ 35[1]	185	125	−32.5
Misc. expenditure	168	227	+ 35[1]	168	114	−32.5
Transport and travel	60	81	+ 35[1]	60	40	−33.3
Other	34	46	+ 35[1]	34	23	−32.5
Teacher cost	965	1 206	+ 25	965	603	−37.5
Total	2 213	3 119	+ 40.9	2 213	1 559	−29.6

1. The school is open for 35 per cent more time than it would be under the conventional system.

In summary, the six-term system would permit a doubling of secondary places at little capital cost and with a reduction in the per-pupil recurrent cost per annum of almost 30 per cent. Additional future places to meet more than a doubling of enrolments would require only 50 per cent as great capital expenditure as the conventional system.

Obviously one could not guarantee the same educational results under this economically more attractive arrangement. Indeed, many people felt strongly that it was not enough for a child to attend school for just half a year. Accordingly, a different alternative scheme was devised, called the full-year system.

The full-year system

Under this system the year would be divided into thirteen four-week periods. For twelve of these periods the school would be working to full capacity, for the thirteenth it would be closed. Though the school itself would be operating for forty-eight weeks of the year, each pupil would attend for only thirty-six weeks. Only three-quarters of the total pupil population would be at school at any one time. The following table shows a possible class progression schedule under such a scheme.

TABLE 20. Class progression of an S.1–S.4 school under full-year system

	Four-week-period												
	1	2	3	4	5	6	7	8	9	10	11	12	13
S.1	H	H	C	C	C	C	H	C	C	C	C	C[1]	H
S.2	C	C	H	C	C	C	C	H	H	C	C	C	H
S.3	C	C	C	H	H	C	C	C	C	H	C	C	H
S.4	C	C	C	C	C	H	C	C	C	C	H	H	H

C = Class H = Holiday

[1] Research would have to be carried out to see how long a child can be effectively taught in school.

Teachers would continue to have twelve weeks of holiday a year—four weeks at Christmas when the school was closed, and either one eight-week holiday or two four-week holidays at other times. By rotating, one-sixth of the teachers would be on leave at any one time. In order to maintain present teaching loads, however, roughly 20 per cent more teachers per school would be needed. It was thought more desirable as an alternative to raise the salaries of present teachers by 10 per cent, and utilize them more fully, than to expand the number of teachers this much.

Under this scheme, a three-stream S.1–S.4 school with twelve classes could add an extra stream with no added capital cost. In the case of two-, four- and six-stream schools, with eight, sixteen and twenty-four classes, it was suggested that with a marginal capital investment and some degree of cramming enrolments, the number of streams could be increased by 50 per cent. It was not thought possible to implement this scheme in a one-stream school. On the basis of the number of one-, two-, three-, four- and six-stream schools existing in 1965/66, it was calculated that the full-term system would enable schools to accommodate 44 per cent additional pupils with only a marginal capital expenditure, and that further places could be constructed for two-thirds the conventional cost. Thus, over the plan period, approximately 140 million shillings capital could be saved.

As two-, four- and six-stream schools would have to have more teachers (at least one teacher more for every twelve they would normally have), as well as the 10 per cent rise in teacher salaries, the increase in teacher costs for this 44 per cent increase in pupils would be approximately 15 per cent. In terms of over-all recurrent cost, it appeared that this full-year system would save 10 per cent per pupil compared to the conventional system.

Various meetings were held with the secondary school headmasters on these schemes. Their main objection was that, with the discontinuity of both staff and pupils (different pupils and different staff being at the school at different times of the year), the schemes would be almost impossible to organize and manage well.

One final system was therefore worked out, with a view to avoiding the problem of discontinuity. This was called the four-term system.

The four-term system

The essence of this system was that the school would run as a teaching establishment for forty weeks of the year (as under the conventional system) but each pupil would be at school for only three ten-week terms. However, pupils in the senior forms would also have two three-week periods of supervised study on the school premises. Under these arrangements the same increase in enrolments would be possible as under the full-year system. The following table shows a possible organization.

TABLE 21. School organization under four-term system

	Jan-Mar 10 weeks	April 3 weeks	Apr-Jun 10 weeks	July-Sept 10 weeks	Oct 3 weeks	Oct-Dec 10 weeks	Dec-Jan
S.1	Holiday	Holiday	Taught	Taught[1]	Holiday	Taught	—
S.2	Taught	Holiday	Holiday	Taught	Holiday	Taught	—
S.3	Taught	Study	Taught	Holiday	Study	Taught	—
S.4	Taught	Study	Taught	Taught	Study	Holiday	—

[1] Final examinations.
(See note to Table 17)

This system had the disadvantage compared to the full-year system of each pupil having less teaching time (though more than in the six-term system). Economically, however, though the savings in capital would be the same as under the full-year system, the savings in recurrent expenditure would be greater—firstly because the only additional teaching cost would be a duty allowance to the teachers supervising the study during holidays and, secondly, because the school would be operating for less of the year than under the full-year system. Costing this system in the same way as was for the six-term system, it was calculated that the reduction in annual recurrent expenditure per pupil would be about 20 per cent.

None of these schemes met with the approval of the teaching profession and none was in fact adopted. None the less, there is reason to believe that the threat of radical change made all schools in the country strive hard to increase their capacity at little extra cost. Between 1965 and 1968 enrolments increased by over 75 per cent in secondary schools (and output by even more) with only a marginal capital expenditure.

This increase in enrolment was achieved in three main ways: (1) more schools went over to double day-shift operation; (2) all existing capacity was more fully utilized (e.g. by double bunks, abolition of the home classroom, conversion of other facilities into classrooms, use of neighbouring primary school classrooms, etc.); (3) boarding schools took in an increasing number of day pupils from the neighbourhood. Also, some of the best established schools introduced 'express streams' in which good pupils could prepare for the C.S.C. exam in three years instead of the previous four years (thereby reducing the cost per qualifier).

University

Makerere University College operated for only 30 weeks of the year at full capacity; the staff-student ratio was very low and the norm for staff-student contact was only 9 hours a week. Quite obviously any argument about under-utilization of school buildings and teachers applied with much greater force to the university.

If the university could be run for four terms of ten weeks, with each student attending only three terms, there could be a one-third increase in enrolment with no substantial additional facilities. Expatriate staff members, constituting the large majority, would have to be given three months' home leave every two years (equivalent to one term's absence) and this would require 'over-staffing' by about 14 per cent. It was calculated that such a scheme would reduce the annual recurrent cost per student by 15 per cent, a saving of 2,100 shillings per student in 1971. On the capital cost side, as noted, there could be a one-third increase in enrolment at only marginal capital cost; thereafter the capital cost per student place would be only two-thirds of that previously estimated.

If this scheme had been implemented the recurrent costs (with the proposed increased intake) would have been 5 million shillings less than originally estimated and the capital costs over the plan period 11 million shillings less. But it would perhaps be expecting too much to have such radical changes accepted quickly in any educational system, particularly in a semi-autonomous university, not only because they would entail considerable inconvenience for faculty, students and families, but because many honest doubts were held regarding the pedagogical consequences. But until such changes were actually tried, the consequences would remain unknown.

C. The special case of universal primary education

As mentioned earlier, government had instructed the Working Party to work out the cost implications of a scheme providing for compulsory, universal, free primary education by the middle of the third plan (1971/72 to 1976/77). 1974 was therefore taken as the target year, and the scheme was planned to start in 1968 seven years before the planned date of achievement.

Universal primary education would clearly be an expensive affair and the Working Party could see no great opportunities for permanently reducing the per-pupil costs compatible with maintaining (and if possible improving) the quality of education given. Such cost reductions as were involved in the scheme which the Working Party devised were not the result of intentional policy recommendations (as in the case of secondary and higher education) but simply the automatic cost changes (especially of teacher costs) in any rapid expansion of primary school enrolments. Most such cost reductions, unfortunately, were of only a short-term nature and would turn to cost increases as the primary system settled down.

The first problem to be faced was one of definition. It was decided that universal primary education meant that each child in the country should, in principle, have an opportunity to proceed from P.1 through to P.7. Since repeating rates ranged on average from 9 to 15 per cent of each class, a scheme for universal primary education would actually have to cover an eight-year period (6–13) rather than the seven-year period (6–12) that a seven-year primary system might be thought to imply.[1] The population of the 6–13 age-group was therefore estimated from 1959 through to 1976. Though the 1959 census showed that the population of Uganda was growing at 2.5 per cent per annum (0.3 per cent of this due to immigration) it was estimated that the 6–13 age-group was growing at 2.75 per cent per annum.

The next problem was to decide what number of children should be admitted when the scheme started in 1968. On the basis of primary education statistics, it was estimated that there would be 970,000 children in the 6–13 age-group at the beginning of 1968 who had not been to primary school. If all were suddenly taken in there would be a tenfold increase in P.1 intake in 1968 over 1967, followed by a fourfold decrease the year after. This obviously made no sense, particularly since this temporary bulge group would have to move through the rest of the system for years to come.

The available statistics suggested that in a normal year 40 per cent of the P.1 intake was six-year-olds. If there was unrestricted entry in 1968 with all six-year-olds being taken into school and those six-year-olds still only being 40 per cent of the total intake, an intake of 570,000 would be required, a six-fold increase, followed by a halving the year after. This again would pose serious problems.

The Working Party came to the conclusion that the most reasonable solution would be to expand P.1 intake (of all ages) in 1968 to the level that it would need to be in 1974 in order to accommodate all six-year-olds then. P.1 intake would then be held constant from 1968 to 1974, and about 340,000 of the 740,000 backlog catered for over the whole period. However, the Working Party felt that it was not its responsibility to judge whether there should be restrictions in entry or not, and thus a scheme where the six-year-olds were 40 per cent of the total P.1 intakes in 1968 was also costed. As the basic principles of both schemes are the same, we need only discuss here the first.

The basic principles of the scheme were as follows:

1. P.1 intake would be increased from the existing 35 to 48 per class. Allowing for mortality and repeating (no drop-out assumed), the P.7 class size by 1976

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[1] Though the Working Party assumed that repeating rates would remain at roughly their previous levels, it was in fact likely that the planned structural changes in the system would change these rates radically. The Working Party had no idea of the magnitude of the problem.

when the system had reached equilibrium would average 40 to 42. This increase in average class size was not considered seriously detrimental, especially since 10 per cent of the children could be assumed to be absent at any one time.[1]

2. The number of P.1 classes would remain constant from 1968 to 1974 at 6,750. The number of P.2 classes should be the same as the number of P.1 classes the year before, and so on through P.3–P.7. Thus by 1974 there would be 6,750 P.1, P.2 . . . P.7 classes.
3. There should only be one teacher per class, and no supernumery headmasters.
4. Unqualified teachers would obviously have to be used, but they would never be more than half the total teaching force. These unqualified teachers would not be dismissed when the rapid expansion ended but would have an opportunity to become qualified through continuous training (see below).
5. Each primary-school classroom would be used on a double shift basis, and for every two classes there would be one qualified and one unqualified teacher. The qualified teachers would teach the basic subjects to both classes, inside the classroom, while the unqualified teacher handled cultural and practical subjects, such as music, handicrafts and games, outside the classroom. The following table shows a possible organization of a school on this basis.

TABLE 22. Double day shift organization of primary school

Time	P. 1, P. 3 and P. 5			P. 2, P. 4 and P. 6		
	Subject	Place	Teacher	Subject	Place	Teacher
8 a.m.	First classes arrive			—	—	—
8 a.m.–9 a.m.	Basic	Class	Unqual.			
9 a.m.	—	—	—	Second classes arrive		
9–10.30 a.m.	Cultural & practical	Outside	Unqual.	Basic	Class	Qualified
10.30–12 noon	Basic	Class	Qualified	Cultural & practical	Outside	Unqual.
12–1 p.m.	Lunch	Outside	Qualified	Basic	Class	Unqual.
1–2 p.m.	Basic	Class	Unqual.	Lunch	Outside	Unqual.
2–3 p.m.	Cultural & practical	Outside	Unqual.	Basis	Class	Qualified
3–4 p.m.	Basic	Class	Qualified	Cultural & practical	Outside	Unqual.
4 p.m.	First classes and unqual. teacher stop			—	—	—
4–5 p.m.	—	—	—	Basic	Class	Qualified
5 p.m.	—	—	—	Second classes and teacher stop		

As can be seen from the above table, each pupil would have 7 hours lessons a day, 4½ hours basic subjects (3½ of which are taught by the qualified teacher) and 2½ hours cultural and practical subjects; 4½ hours in the classroom and 2½ hours outside. Each basic period would be separated from the next basic period either by a cultural and practical period or by lunch.

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[1] Nevertheless all 48 children would have to be taught.

Such a system would have two main advantages over a conventional system. Firstly, in a situation where there have to be unqualified teachers, most subjects that should be taught by someone with pedagogical training would in fact be taught by such a person. Secondly, at least in the short run, it would involve a considerable saving of capital expenditure, since each P.1–P.7 school would only need 4 classrooms instead of 7.

After 1972 the first unqualified teachers would be returning to the system qualified and the percentage of unqualified teachers would begin to fall, until by 1983 there would be none. Similarly, after 1974, when the tremendous task of building a universal P.1–P.7 system would be completed, attention could then be shifted to phasing out of the double-shift and providing each class with a classroom. Essentially the scheme proposed by the Working Party allowed for some postponement of both recurrent and capital costs involved in universal primary education until after the enrolment target was achieved (on provisional grounds).

The basic principles of the teacher-training programmes proposed for this scheme of universal primary education were as follows: (i) no more than 50 per cent of the teachers should be unqualified at any one time; (ii) teacher-training establishments should not be expanded at such a rate that they would to be cut back at some later time; and (iii) facilities should be made available for training the unqualified teachers after they have been teaching for a while, so that they do not have to be dismissed when qualified teachers become available.

Applying these principles, the Working Party made the following recommendations:

(a) that Grade III intake (2 years training after C.S.C.) be doubled, from its 1968 planned level of 900 to 1,800 per annum in 1971;

(b) that from the beginning of 1968, Grade II colleges (4 years' training after primary school) would stop their normal intake, and start taking in unqualified teachers who had been teaching for some time to give them a two-year course. The fact that the course was two years instead of four would allow the output to be doubled at no extra capital or recurrent cost;

(c) that starting December 1967–January 1968 all teacher-training colleges would offer elementary teaching courses, for two vacations a year, for the large number of unqualified teachers who would be taken into the system (thus each unqualified teacher could have an average of four or five vacation courses before finally entering a Grade II college for a two-year training course).

Under the above proposals it was estimated that the composition of the teaching force would evolve as shown in Table 23.

Costs of scheme

(a) *Recurrent costs.* The main element of recurrent costs per pupil would depend on three factors: the composition of the teaching force, the salary scales of the various grades of teachers, and the pupil/staff ratio.

Table 23. Composition of teaching force, 1964–76 (as percentages)

Year	Unqualified	Grade I	Grade II	Grade III
1964	8.5	35.3	47.8	8.4
1965	8.0	33.1	49.9	9.1
1966	7.4	30.9	51.9	9.8
1967	7.0	29.0	53.7	10.3
1968[1]	23.8	22.2	45.1	8.9
1969	36.6	17.2	38.5	7.7
1970	42.9	14.0	34.0	9.1
1971	47.3	11.7	31.0	10.0
1972	48.4	10.0	28.6	13.0
1973	49.4	8.7	26.8	15.1
1974[1]	48.1	7.7	27.2	17.0
1975	43.1	7.4	29.7	19.8
1976	38.5	7.0	32.0	22.5

NOTE Assuming a 3.8 per cent per annum wastage of stock.

[1] U.P.E. scheme would start in 1968 and be completed in 1974.

Applying prevailing salary scales to the staff composition as shown in Table 23, a teacher salary index was calculated. From the enrolment preparations pupil/staff ratios were determined for each year, and from the index and the ratio combined a teacher cost per pupil was calculated. All these figures are shown in Table 24.

Table 24. Per-pupil costs of U.P.E. 1964–76[1]

	1964	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Teacher salary index	1 040	1 074	1 013	965	950	966	1 001	1 024	1 052	1 101	1 148
Pupil-staff ratio	34.7	37.6	41.6	41.1	40.8	40.5	40.2	39.9	39.9	41.2	41.9
Teacher cost per pupil	132	126	108	104	102	106	110	114	116	118	120
Total recurrent cost per pupil	170	164	146	142	140	144	148	152	154	156	158

[1] It was assumed that annual non-teaching costs (the difference between teacher cost and total recurrent cost in this table) would remain constant at 38 shs. per pupil, and that fees (averaging 30 shs.) would be abolished at the start of the scheme in 1968.

If the teacher salary index can be taken as at least one rough indicator of the quality of the teaching force, then quality, as may be seen in Table 24, could be expected to decline at a moderate rate to 1970 and thereafter rise, reaching a level considerably higher by 1976 than before the scheme began in 1968.

Aggregating the above per-pupil costs, the Working Party calculated that total recurrent costs under this scheme for universal primary education would rise from 73.6 million shillings in 1964 to 180 million in 1971 (47 per cent higher than the 122.5 million in the original Working Party Report), and further to 290 million shillings in 1976, an increase of almost 300 per cent between 1964 and 1976.

Primary teacher-training recurrent expenditure would be 8.5 million shillings higher than originally calculated for 1971 (60 per cent higher than the original figure of 14.1 million) and 15.6 million higher in 1976. Thus in total the scheme would add 66 million shillings to the recurrent cost of primary education in 1971.

(b) *Capital costs.* It was estimated that 30 per cent of schools existing in 1966 were in areas where there were sufficient children to warrant adding another 'shift' at no capital cost.

All the remaining increase in enrolments would have to take place in new buildings. However, by using double day shifts only four classrooms would be needed for a P.1–P.7 school. (In remote areas only two classrooms, because where population was not dense a biannual intake would be the norm).

It was further assumed that the unqualified teacher would not be housed, as he would be working in the area in which he normally resided. Thus the capital cost per classroom was assumed to remain as it was originally estimated, i.e. 12,000 shillings. (This low figure still assumed considerable unpaid self-help from the local community.)

On the basis of the above assumptions, the estimated capital cost of the scheme would be 88 million shillings during the period 1968–71 and 74 million shillings during the period 1971–76.

The estimated extra capital cost of teacher training was approximately 20 million shillings for the period 1968–71.

D. The rationale and feasibility of the revised plan

The revised educational plan, designed to accommodate government proposals, differed from the draft plan in two major respects. Firstly, it involved a more rapid increase in enrolments at all levels of general education, the greatest effort going to primary education and the lowest to university. Secondly, it involved radical proposals for reductions in unit costs, particularly at the secondary level.

Depending on the extent to which the various radical cost-reducing proposals were accepted, over-all capital expenditure would run between 218 million and 418 million shillings over the plan period, and recurrent expenditures in 1971 would total between 340 million and 380 million shillings.

In the original feasibility check it was estimated that capital expenditure on education would total 160 million shillings over the plan period and recurrent expenditure in 1971, 240 million shillings. Thus even if all the most radical cost-reduction proposals were accepted and implemented *immediately* (a dubious and unwise assumption), there would have to be considerable reductions in government expenditure in other sectors, or further increases in government revenue, or reductions in real wages and salaries, in order to finance the new educational plan. If none of the cost-reducing proposals were accepted, then the revised plan would be financially feasible only if the government was prepared to devote 30 per cent of its recurrent budget and almost 25 per cent of its development resources to education (compared to *20 per cent* and *9 per cent*, respectively, under the earlier draft plan).

A very simple cost-benefit analysis was done,[1] and, on the basis of the assumptions used, the benefits for primary education were found to be higher than those for lower secondary education, while the cost-benefit ratio for university education was the lowest of all, in fact less than 1:1.

Bearing in mind the limitations and difficulties of cost-benefit analysis, the exercise did give plausible reinforcement to the Working Party's proposals for drastic cost-reducing measures in secondary and university education. It also lent justification to the government's desire to expand primary education proportionately more than secondary and university education— at least if the assumption made, that primary education really would increase a person's earning significantly, was accepted.

On the latter point, the Working Party was conscious that if a rapid increase in primary enrolments was to be justified on economic grounds, it would have to be accompanied by a reorientation of primary education away from academic and towards practical studies—towards those subjects that might be more useful for the vast majority of primary school children who were destined to earn their livings from the land. But such a reorientation, even if agreed to in principle, would obviously have to be preceded by a reorientation of primary teacher training.

IV. The published plan and subsequent revisions

A. 'Work for progress' - Uganda's Second Five-year Plan

Uganda's Second Five-year Plan (1966/67 to 1970/71) was published in May 1966. It differed in over-all terms from the draft outline plan discussed earlier in three major respects.

1. The rate of growth of GDP was reduced from the original target of 8.5 per cent per annum to 6.3 per cent per annum. This reduction was due partly to a lowering of expectations, but also to an upward revision of the base year figures based on more up-to-date information. (The first industrial census had just been completed, the first agricultural census was under way.)
2. A reduction of the gross fixed capital formation target was made, from 5,200 million shillings to 4,600 million shillings.
3. Alternative programmes of government development spending over the plan

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[1] For a description of this exercise see J. A. Smith and N. L. Bennett, 'Rates of return on investment in education: a tool for short-term educational planning, illustrated with Uganda data', in *World Year-book of Education 1967*, London, Evans Brothers, 1967.

period were worked out to give the plan more flexibility in case either aid flows or export earnings were higher or lower than forecast. The trend level of development expenditure over the plan period remained at 1,800 million shillings (which was equivalent to only about 1,600 million shillings capital formation because some items in the development budget were not capital formation), but a minimum target of 1,440 million shillings and a peak target of 2,160 million shillings were also set. Defense expenditures were not included in these targets (they were in the draft plan).

The projects and programmes in the plan coincided with the peak rather than the median target. Such a policy was not as unreasonable as it might seem at first sight, since it is always necessary to have more projects available in a plan than it is intended to complete, to allow both for a carry-over of semi-finished projects at the end of a plan and for the elimination of some projects when subsequent information suggests that this is advisable.

Education received far more emphasis in the published plan than in the draft outline plan. This is demonstrated by the following table, so far as capital expenditures were concerned.

TABLE 25. Changes in planned government development expenditures from draft to final plan

	Draft plan expenditure		Final plan expenditure	
	million shs.	%	million shs.	%
Productive services	376	20.9	579	26.8
Economic overheads	408	22.7	520	24.1
Social services	518	28.8	716	33.1
(Education)	(160)	(8.9)	(370)	(17.1)
Law and order[1]	200	11.1	183	8.5
Adminis. and miscell.	40	2.2	98	4.5
Local government[2]	160	8.9	30	1.4
Resources	98	5.4	34	1.6
Total	1 800	100.0	2 160	100.0

1. Defence included in draft plan but not in final plan.
2. Local government expenditure financed directly by central government in final plan figures included under relevant head.

The educational plan

None of the cost-reducing measures proposed by the Working Party were accepted by the government, nor were they rejected; they were referred for further study. The goal of universal primary education was also temporarily postponed, but enrolment targets were nevertheless lifted. The greater increases proposed by the government in university and S.5–S.6 intakes were also incorporated in the plan, along with half the proposed increase in S.1–S.4 intakes.

There was no major difference in the unit recurrent costs used by the Working Party and those used in the final plan. But there were some significant differences in the capital unit costs, resulting from the following factors:

1. The professional fees and site supervision fees earlier omitted in costing secondary-level construction costs were now included
2. Capital costs for university expansion were now based on actual project studies —not on an estimated per-student cost as earlier
3. It was decided to rationalize primary teacher training into four new regional colleges, with the existing colleges converted to other uses; thus the capital costs of primary teacher training expansion were worked out on a project basis
4. It was felt that special attention should be paid to primary education in Karamoja, a particularly backward area of Uganda inhabited by nomads with only 10 per cent of the school-age population in school; hence a special 15 million shillings programme for this purpose was included in the plan.

Table 26 summarizes the education plan as published in *Work for progress*. There is one major error in this table. The estimated and planned recurrent expenditures for university and overseas study for 1965/66 and 1970/71 were not calculated on the same basis. The 1965/66 figure, derived from the government recurrent estimates for that year, included only the Uganda government's direct contribution per Ugandan student and not the substantial portion (20 to 30 per cent) coming from the East African Community. The 1970/71 figure, on the other hand, was based on the estimated *full* cost per student and not merely the share which the Uganda government might pay. Thus, the 1965/66 figure under-estimates total expenditure (only showing Uganda government expen-

TABLE 26. Uganda Second Five-year Plan—Education 1966/67 to 1970/71. Recurrent and capital costs in thousand shs.

	1966 estimated enrolment	1965/66 estimated recurrent	1971 planned enrolment	1970/71 planned recurrent	1966/67 to 1970/71 planned capital
Primary	577 000	80 820	804 000	112 560	40 000
S.1–S.4	18 500	32 400	30 500	60 100	130 000
S.5–S.6	1 600	3 160	4 220	7 320	30 000
Grade II and III T.T.	3 900	10 100	4 000	11 940	70 000
Grade V T.T.	290	3 400	500	5 000	4 000
Technical schools	900	2 400	1 500	4 200	10 000
Farm schools	440	1 220	2 040	5 600	26 000
Uganda College of Com.	180	1 160	500	3 260	10 000
Uganda Tech. College	420	4 580	540	6 000	10 000
University	940	22 000	2 400	52 000	40 000
Overseas	1 400		1 400		—
Total		161 240		267 980	370 000

SOURCE Table 33, *Work for progress*, Government Printer, Entebbe, Uganda, 1966.

NOTE (i) This table includes fees paid by pupils except in primary school, which in 1965/66 are estimated to amount to 9,300,000 shillings and in 1970/71 (if there is no change in policy) to approximately 15 million shillings.

(ii) The capital cost of primary expansion does not include the parents and community effort of approximately 40 million shillings.

diture) whereas the 1970/71 figure over-estimates direct Uganda government expenditure.[1]

B. Later revision of the Second Five-year Plan

A published plan is never an absolutely final document, especially in a country such as Uganda where the idea of comprehensive planning is still very young and the purpose of planning still not widely understood.

The Ugandan Second Five-year Plan contained a quite comprehensive treatment of the problems involved in developing the economy, outlined a strategy for development, spelt out this strategy in macro terms, set various targets for particular sectors and individual industries, and laid out in some detail a list of the highest priority government development projects.

It was quite evident, however, that not all of the projects in the plan could be implemented. As indicated earlier, the list contained more projects than there would probably be resources to finance. Beyond this, the cost estimates of some projects were bound to prove low, and it could also be expected that new and higher priority projects would emerge as time went on.

Accordingly, before the long and detailed work of project preparation was undertaken, it was felt advisable to fix more certainly those projects most likely to be implemented and those least likely.

No ceiling was fixed for educational development expenditure in this revision, but a general feeling was shared by technicians in the Ministries of planning and finance, and by various visiting Aid Missions, that the 370 million shillings development expenditure foreseen for education should be reduced, on practical grounds, to around 240 million shillings. Thus work started on what might be called 'critical project preparation', each project in the educational plan being studied to determine (a) whether its function and purpose was clear; (b) whether it was likely to be implemented; (c) what its direct and indirect effects would be.

Only after these questions had been satisfactorily answered was the project worked out in full detail for inclusion in the second volume. If the above points could not be satisfactorily answered the project was either shelved or revised. It is instructive to examine a few illustrative projects for which revision or postponement proved to be desirable on closer examination.

Projects delayed because of unclear function and purpose

At the beginning of October 1968, the future of the technical and farm school programmes was still in doubt. A special committee of enquiry had studied the situation of farm schools and concluded that they should not be expanded further unless government introduced specific programmes to assist farm school leavers to become progressive farmers. The existing farm schools were training students to become modern farmers at considerable cost (roughly equivalent to secondary boarding schools' costs). But they emerged with no capital and often no land. Thus the cost-benefit ratio was clearly worse than 1:1, and could be improved only if the trainees were provided with a considerable area of land and loaned a relatively large sum of capital (more than 5,000 shs.).

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[1] The financing of the University of East Africa is more fully explained in 'Uganda: the use of cost evaluation in the planning of Makerere University College', op. cit.

At the same time, the government was also considering the proposals of a committee on technical training which had recommended a complete change in the apprenticeship system in the country, incorporating the existing technical schools which would provide part-time sandwich courses for apprentices rather than the existing full-time courses for primary school leavers.

Thus although no definite revision in the technical and farm school programmes had yet been made, it could be predicted with considerable certainty that, because of the delays inherent in project preparation and aid application, little capital development would take place in these areas of education during the plan period.

Projects unlikely to be implemented for lack of resources

As noted earlier, 62.5 per cent of government's over-all capital formation was expected to be financed by foreign sources, and since most assistance agencies declined to support more than 70 per cent of the cost of any project, this meant that every large project would have to include a substantial portion of foreign funding. But in the case of primary education particularly, this did not prove feasible.

The 40 million shs. capital included in the plan for primary education expansion was for the following programmes: (i) grants to local authorities for Grade III development teachers, 23.3 million shs.; (ii) a special programme for assistance for primary education in Karamoja, 15 million shs.; (iii) the construction of a high quality primary school for expatriates and high income Ugandans in Kampala, 1.7 million shs.

After intensive investigation it became apparent that neither of the first two primary education programmes would get any foreign support, not only because most donors had a low interest in primary education, but also because of the very low import content and the small size and wide geographic dispersion of primary education projects. Thus, even though government attached high priority to these projects, it was decided on financial grounds that they would have to be postponed or radically reduced.

The third primary education project—the 'blue ribbon' primary school in Kampala—fared better. Obviously if expatriates were to be recruited there must be good quality educational facilities for their children, especially in the capital city. Originally it had been planned to build a special primary school for this purpose on a co-operative basis (embassies and foreign private firms being asked for contributions) in the same way that most other primary schools were constructed. But since this project had special attractions, the British government eventually agreed to finance its construction with a development loan. As it turned out, the capital costs of this project escalated from the original estimate of 1.7 million shs. to 2.3 million shs. by the middle of 1968, and were expected to rise even higher. Thus the cost per place (over 3,000 shs.) would be more than ten times the cost per place to government of a conventional primary school.

As far as the general expansion of primary education was concerned, it was felt that this would have to go ahead without any central government development (i.e. capital) assistance, again for reasons of financial stringency. Thus it was decided that the usual capital grant to localities for Grade III 'development teachers' would temporarily be suspended. The only capital allocation made for the general expansion of primary education was 500,000 shs. per annum, to be used for special grants to local authorities in particular difficulty.

During the first two years of the plan, for the reasons given earlier, no money was spent on the expansion of primary education in Karamoja, and enrolments thus stagnated at about 10 per cent of the notional age group (whilst the average for the whole country was over 50 per cent). It was still felt, however, that special help should be given to Karamoja, but on a feasible scale. Thus a more limited programme was designed to allow enrolments to increase at about 10 per cent a year. This required a capital investment of 1 million shs. per annum for each of the last three years of the plan.

Projects revised because if their troublesome implications

It had long been felt that the existing system of primary teacher training was not producing satisfactory results, was not efficient, and was not conducive to national unity. The system comprised twenty-six small colleges, mainly of religious foundation, 90 per cent of whose enrolment were students studying to be Grade II teachers (four years' training after primary school). Consequently, the Working Party had originally recommended that the twelve largest existing colleges be expanded to an enrolment of 450 students each, and that four of these be used for Grade III teacher training (two years after C.S.C.). This would provide an output of 900 Grade III teachers a year (from four colleges) and 900 Grade II teachers a year (from the other eight). The remaining fourteen small colleges (average enrolment under 100 each) would be closed down.

This scheme had been abandoned in the published plan, however, in favour of a much more ambitious programme which USAID showed interest in assisting. This new scheme involved closing down all twenty-six existing colleges and creating four entirely new regional colleges. Each would have an enrolment of 1,000 students, would train exclusively Grade III teachers (with a view to upgrading the teaching establishment more rapidly) and together would turn out 2,000 Grade III teachers per year.

The capital costs of this new training programme were originally estimated at 70 million shs., but on closer examination it became evident that the original capital estimate would have to be increased to 110 million shillings.

It also became evident that the recurrent costs would be much higher than in the old colleges, for four main reasons: (1) in the old colleges only 28 per cent of the tutors were university graduates, whereas in the new colleges all tutors were expected to be graduates; (2) 57 per cent of the teaching force of the existing colleges were Ugandans, but for quite a time only 30 per cent of the higher-qualified teaching force of the new colleges could be expected to be Ugandans; (3) it was planned to retain the previous teacher/student ratio of 1:15; moreover, it was proposed that these new colleges would have (on the American pattern) a qualified administrative staff of eight in addition to the teaching staff (e.g. a principal, deputy principal, student councillor, librarian, etc.), whereas the existing colleges had no such staff; (4) the non-teaching costs were also likely to be much higher because of the more extensive amenities, the greater use of teaching aids and teaching materials, and the greater expense of supervising teaching practice (since with large numbers of pupils, schools for practice teaching would be spread over a wide area).

Even more worrying than these unexpectedly high direct capital and recurrent costs, however, were the serious indirect effects which this attractive teacher-training scheme would have on costs elsewhere in the educational system.

Firstly, the new scheme aimed at bringing all primary teachers to Grade III level as quickly as possible, whereas the previous objective had been to have one or two Grade III teachers per seven-class primary school. The result would be to add 3.6 million shillings annually to the recurrent costs of primary education without increasing enrolments. Secondly, a capital grant of 12,000 shillings was made to local authorities to cover the cost of housing for a Grade III teacher, and the increased use of Grade III teachers would cost an extra 7 million shillings under this heading. Thirdly, converting the teacher-training colleges into secondary schools would cost an additional 60 million shillings and would entail a recurrent expenditure of 15 million shillings annually. Finally, the proposed standard of facilities in the new teacher-training colleges would be much higher than in any other institutions at the same level. Consequently it was feared in some quarters that this might have serious repercussions on other parts of the educational system.

The government studied the above implications and came to the conclusion that the project could not, even though it was aid-supported, go ahead as planned. It was accordingly re-phased. Instead of planning to open all four colleges in 1969, one was planned to be opened in 1970, one in 1972, one in 1974 and the last in 1976. In this manner the closing of the existing colleges could be phased into the planned expansion of secondary education.

The existing plans for the new colleges were also studied and many items considered non-essential were trimmed out. In this way the capital cost of the whole programme was reduced from an estimated 110 million shs. to 88 million shs. Of this amount only 30 million shs. would be required during the plan period 1966/67 to 1970/71, as against 70 million shs. prior to the trimming and rephasing.

On the recurrent cost side the staff/student ratio was increased to 1:20 (from the planned 1:15) and it was decided that only 70 per cent of the tutors needed to be graduates (against the originally planned 100 per cent). Even so, the recurrent cost per pupil per annum was likely to remain very high (about 5,000 shs. compared to an average of 2,600 shs. per pupil for Grade II and Grade III teacher training in the old colleges in 1965/66).

There still remained, however, the serious long-term implications for the costs of primary education. Without a change of policy, the programme would still eventually force (though further in the future than before) a 30 per cent increase in primary education costs per pupil. (Total costs for a seven-class primary school with two Grade III teachers and five Grade II, with average salaries as above, and non-teaching costs at 38 shs. per pupil—49,220 shs. Total costs with 7 Grade III teachers—63,420 shs., or 28.9 per cent higher.) Looked at in another way, for the limited resources available for primary education, without this programme 30 per cent more children could be at school.

Revision of other projects

As specific project information became available on the Uganda Technical College and the Uganda Commercial College, it was possible to study the plans in detail and to cut non-essentials. The U.C.C. capital requirements were reduced to 8.4 million shs. and the U.T.C. requirements to 4 million shs. Such reductions, it should be emphasized, could be made only at the stage when full project information became available.

As noted earlier, after the plan took effect secondary enrolments expanded much more rapidly than planned. S.1 intake in 1968 was 9,190 compared to a planned 7,700, and S.1–S.4 enrolments reached 28,000 compared to a planned 26,000. Meanwhile S.5–S.6 enrolments fell short of the target by 500, which meant that although the university intakes could be achieved, the manpower shortage of S.6 leavers would be prolonged an additional two years. As of late 1968, all indications were that the S.5–S.6 targets would be met by 1971, whereas the S.1–S.4 targets would be considerably over-shot (possibly reaching an intake of at least 10,500 in 1971 against a target of 8,300).

Though much of the increase in secondary enrolments from 1966 to 1968 was achieved at almost no capital cost, this could only be considered a temporary phenomenon. It was estimated that if standards were to be maintained at reasonable levels (schools having adequate laboratories and classrooms), a total of at least 174.8 million shs. of capital outlay would be required over the plan period, as against the 160 million shs. originally planned. In short, the 'bunching' of capital outlays which had been foreseen for the early years of the plan did not materialize (only 8 million shs. were actually spent in the first two years); the 'bunching' would occur in the later years instead.

An overview of the revisions

The Uganda educational plan which was published in May 1966, has since been revised continuously, and no doubt will keep on being revised—to take account of more up-to-date information on specific projects, new developments in foreign aid prospects, and other changing conditions, and in some instances to reflect new agreements within the educational community.

The following table contrasts the Working Party's original capital cost estimates, the published plan figures, and what the plan might have looked like if it were recast as of October 1968 to take account of various considerations mentioned earlier in this study.

TABLE 27. Capital costs of educational development 1966/67–1970/71 (in thousand sh.)

	Original Working Party estimates	Published Plan figures	Hypothetical October 1968 revision
Primary	42 840	40 000	6 800
Secondary	98 128	160 000	178 200
Technical and Farm	9 804	36 000	3 000
Grades II and III T.T.	28 400	70 000	25 000
Grade V T.T.	2 200	4 000	5 500
U.C.C.	4 900	10 000	8 400
U.T.C.	4 900	10 000	4 000
Makerere (Priority I and II)[1]	9 616	40 000	41 240
Total	200 791	370 000	272 140

[1] The priority ranking of university projects is discussed in 'Uganda: the use of cost evaluation in the planning of Makerere University College', op. cit.

The hypothetical revised plan (in the third column of Table 27), it should be emphasized, is entirely the author's own invention and is offered purely for illustrative purposes.

V. Conclusions and lessons

This case study has attempted to recount and analyse various experiences in Uganda's initial efforts between 1964 and 1968 to establish comprehensive economic and social planning, including integrated educational planning. Our attention has been focused especially upon the role of cost analysis in the various stages of formulating the educational plan and, later, revising it.

Uganda's experience was chosen by the IIEP for special study because it clearly offered a variety of significant lessons and useful clues for other countries concerned with improving their own educational planning. Twelve specific lessons were listed briefly in the Introduction and, to save repetition here, we urge the reader to turn back and re-examine those twelve points in the light of what has been said in the intervening pages.

It is not our purpose to commend or to criticize either the technical or policy aspects of Uganda's experience, or to offer Uganda advice for the future. But it is nevertheless in order for us to call attention to certain particularly meritorious features of the experience and, sympathetically, to note several understandable shortcomings, insofar as this might be of substantial benefit to other countries.

Uganda's experience emphasizes, first of all, that planning must be a *continuous* process, ranging from the initial setting of policy goals and planning targets to their final implementation and evaluation, with many steps in between.

The fact that Uganda's educational plan has been repeatedly revised in many ways, far from being grounds for criticism of the initial plan, is a credit to the commonsense and candour of those involved. We would say: beware the rigid plan or planner. Almost anything about a plan can change from time to time—political priorities, economic conditions, insights into educational and cost aspects, and so forth. Plans that are not modified to reflect such changes can become a dead letter, or worse, a mis-plan. Uganda's experience also re-affirmed that planning must equally be a *realistic* process. A plan is nothing—indeed it may even be a dangerous snare and delusion—unless and until it affects action and is translated into a new reality better than the reality that would otherwise have come about. The Members of the Uganda Working Party on Education and Manpower would probably, today, be the first to emphasize their own valuable lessons in this regard. At the outset of their work they were so preoccupied with economic factors—costs, manpower requirements and economic benefits—that they gave too little attention to basic social and political realities—in particular the powerful aspirations of Ugandan parents for their children to get a little formal education, regardless of what the 'manpower requirements studies' might have to say.

But economic, social and political factors, the Uganda experience showed, are not the only constraining realities for educational development. Sometimes the main bottleneck may be administrative or procedural, as when a Ministry's staff or the construction industry finds itself overwhelmed by too many urgent things to do all at once, or when there are inordinate delays in the processing of a foreign grant or loan over which no one seems to have control.

In all events, it is important that plans be tested for feasibility in terms not only of economic resources but also of social, political, and administrative factors and, not least of all, of human attitudes. Especially when a nation, or even an individual institution, first sets out to plan in a comprehensive, long-range manner, it must be expected that the purpose and nature of planning will not yet be well understood by many of the people upon whom its successful implementation depends. But even after a wider understanding is achieved there will still inevitably be, not conflicts, but legitimate differences of interests and views about such things as priorities and innovations. At that stage planning becomes less a matter of technical methodologies than of getting people to reason together and negotiating a solution in the best interests of education, youth and the nation at large. Indeed, unless a reasonably clear and agreed set of educational aims and priorities is provided at the outset by responsible leaders who reflect public opinion, the technical phases of planning cannot get very far. In Uganda's case, for example, when the Working Parties were first set up, the main guidance they were given was an economic framework for the country's future development. It was only later, after the first draft educational plan was unveiled, that the key policy issues were forced into the open, after which the planning technicians received fuller guidance. Had the Working Party on education given more consideration to social demand from the outset, its initial conclusions *might* have been quite similar, but they would undoubtedly have been presented in quite a different form.

In this connexion there is an important point to be noted regarding the role of manpower requirements and employment conditions in educational planning, which is relevant to many other countries.

As reported earlier in this study, the enrolments initially proposed for higher and secondary education by the Working Party were based on manpower projections from the 1962–64 manpower survey. On independence in 1962 Uganda had been faced with severe shortages of indigenous skilled manpower of every variety. Between 1962 and 1965 there had been an extremely rapid expansion of the education system at all levels (see Appendix II), but the output from this expansion in intakes had not yet reached the labour market at the time the Working Party reported. Thus the idea that a problem of surpluses of qualified Ugandan manpower might arise seemed almost inconceivable to many people.

But by 1968, when the report of the 1967 manpower survey was presented to the government (by which time many secondary school leavers and even some university graduates were finding it difficult to get jobs), people began to realize that surpluses of manpower could be just as serious a problem as shortages.[1] Thus most of the recommendations of this later manpower report, both for expansion and constraint, were acceptable to the government, whereas in the case of the earlier report only those proposals suggesting expansion were acceptable.

Fortunately, in over-all terms, the 1967 Manpower Survey did not involve a radical change in the existing educational plan. It implied that lower secondary schools should expand faster than shown in the 1962–64 survey, but not faster (in fact, slightly slower) than was actually happening; higher secondary schools should expand at the rate shown in the published plan; the university only marginally faster. The major messages of the 1967 report were, first, that government should concentrate more on expanding 'subsidiary' parts of the educational system, particularly commercial, technical, and specialized training (for nurses, agricultural extension workers, etc.,) than on the 'formal' system; and second, that more attention should be given to the *mix* by specialities at various levels than to mere expansion *per se*.

Like educational plans almost everywhere, Uganda's plan concentrated on those activities within the jurisdiction and responsibility of the Ministry of education, but neglected many other training and educational activities, many of a relatively 'non-formal' character, which are vitally important for national development and should therefore be included in any comprehensive planning of the nation's total educational effort.

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[1] *Uganda High Level Manpower Survey 1967 and Analysis of Requirements, 1967–1981*, Entebbe, Uganda, Government Printer, 1969.

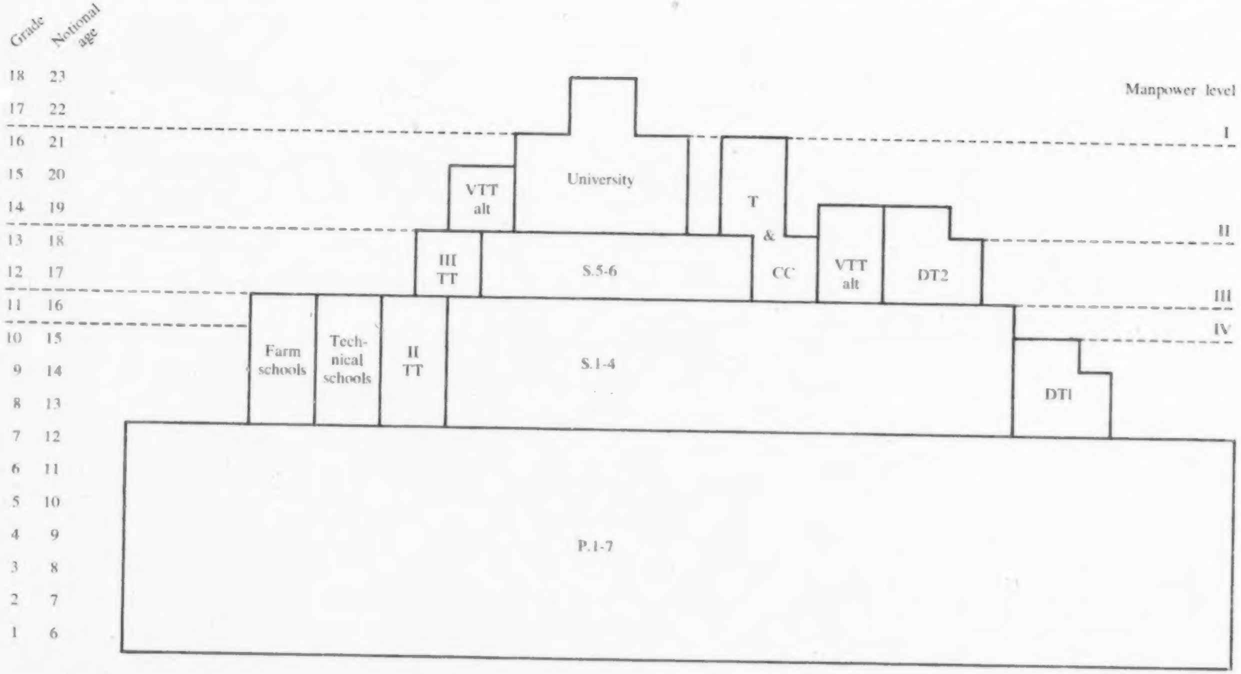
Another important omission in the plan was private non-aided schools, which have been estimated to enrol some 250,000 children at the primary level (mainly in the first few classes) and some 30,000 at secondary (comparable in number with the aided system). The private sector was considered seriously 'sub-standard', and seemed to be contributing relatively few well-qualified persons either to the universities or the employment market. None the less, its students were an important part of Uganda's youth population and, for better or for worse, these schools were using substantial scarce resources. Given the paucity of detailed information about them, however, and the other formidable tasks confronting the Working Party, one can appreciate why tackling this matter was put off to a time when the planning process and information flows were better established.

Finally, a word needs to be said about the matter of cost analysis, which was our principle concern from the outset. From a technical point of view, allowing for the limitations on available data, an impressively extensive and ingenious job was done which obviously helped put the various options and constraints in clearer perspective. In a sense the influence of cost analysis was perhaps more negative than positive; that is, in a number of situations it waved the warning signals against proposals which seemed on the surface attractive but which if adopted and carried out could have been disastrous. The positive result of such a negative action, however, is to release resources to educational activities which are more soundly based and can contribute more.

The most severe constraint on the usefulness of cost analysis, and indeed on the whole educational planning process, was the lack of specific underlying studies, particularly of the utilization (and under-utilization) of existing educational facilities, and of proposed projects. Without sufficient details, the cost analysts were obliged to resort to estimated averages and norms which often proved wide of the mark when the necessary details were finally collected.

By the same token, the lack of detailed and realistic project studies was a major handicap in assessing the plan's feasibility of implementation. All of which emphasizes once more that an educational plan can be of only limited value so long as it is confined to broad national aggregates. These global totals must be translated into specific programmes, and these programmes into specific projects, which in turn must be planned and tested in considerable detail before it can really be said that the plan is a realistic and feasible *plan of action*.

Still, one must start from where one is and move on from there as rapidly as possible. That the Uganda experience could thrust up so many useful lessons for others is the best evidence that it constituted a remarkably good start.


Grade
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18 23
17 22
16 21
15 20
14 19
13 18
12 17
11 16
10 15
9 14
8 13
7 12
6 11
5 10
4 9
3 8
2 7
1 6
Manpower level
I
II
III
IV
University
VTT alt
III TT
S.5-6
T & CC
VTT alt
DT2
Farm schools
Tech-nical schools
II TT
S.1-4
DT1
P.1-7

APPENDIX I. The structure of the Ugandan educational system, 1968

LEGEND P = Primary S = Secondary TT = Teacher training T & CC = Technical and commercial college DT = Departmental training (other formal government training) alt = alternative

NOTES
1. DT.1 includes training in such fields as nursing, community development, land surveying, and agriculture.
2. DT.2 includes training in such fields as nursing, other medical, agriculture, veterinary, fisheries, community development, land surveying, cooperatives, lab. technicians, librarians.
3. The technical and commercial colleges admit at the S. 6 grade both from their own courses and from general courses. This is reflected in the pyramid by an overlap.
4. Manpower level refers to the broad categorization used in manpower planning in Uganda. The definition of the first three levels is given in a footnote to table 3; the fourth level includes those occupations which require at least three years' formal training or education after primary school.

Appendix II
The growth of the Ugandan educational system, 1956-66

Enrolment in publicly aided institutions in Uganda by sector and class,

Sector	Class	1956	1957	1958	1959
Primary	P.1	76 245	83 684	79 550	82 811
	P.2	61 148	64 864	67 722	69 621
	P.3	48 787	54 715	60 112	63 446
	P.4	41 299	46 220	51 892	55 742
	P.5	28 089	36 350	40 886	43 990
	P.6	23 989	27 558	33 603	38 853
Total primary		279 557	313 391	333 765	354 463
Junior secondary	J.S.1	5 741	6 980	8 557	9 687
	J.S.2	4 153	4 490	6 338	7 543
	J.S.3[1]	2 574	2 351	2 457	2 767
Total jun. sec.		12 468	13 821	17 352	19 997
Senior secondary	S.1	1 350	1 367	1 441	1 652
	S.2	1 021	1 429	1 557	1 327
	S.3	915	1 033	1 110	1 406
	S.4	633	794	891	1 073
Total sen. sec.		3 919	4 623	4 999	5 458
H.S.C.[2]	S.5	—	—	—	97
	S.6	—	—	—	—
Total H.S.C.		—	—	—	97
Grade II T.T.C.	Year 1	934	930	745	633
	2 3 4	2 779[3]	2 956[3]	3 050[3]	2 755
Total Grade II T.T.C.		3 713	3 886	3 795	3 388
Grade III T.T.C.	Year 1	62	151	174	179
	2	83	67	134	148
	Upgr.	...	...	...	...
Total Grade III T.T.C.		...	...	...	...
Grade V (3-year course)	Year 1				
	2				
	3				
Total Grade V 3-Year Course					
Grade V (2-year course)	Year 1				
	2				
Total Grade V 2-Year Course					

[1] The J.S. 3 class was run for the benefit of those pupils who were unable to get into senior secondary, and after 1960 was run only at a few schools.

[2] The H.S.C. course was introduced in 1959. Previously, students used to enter Makerere at C.S.C. level and do two preliminary years before embarking on degree programmes or joining professional faculties.

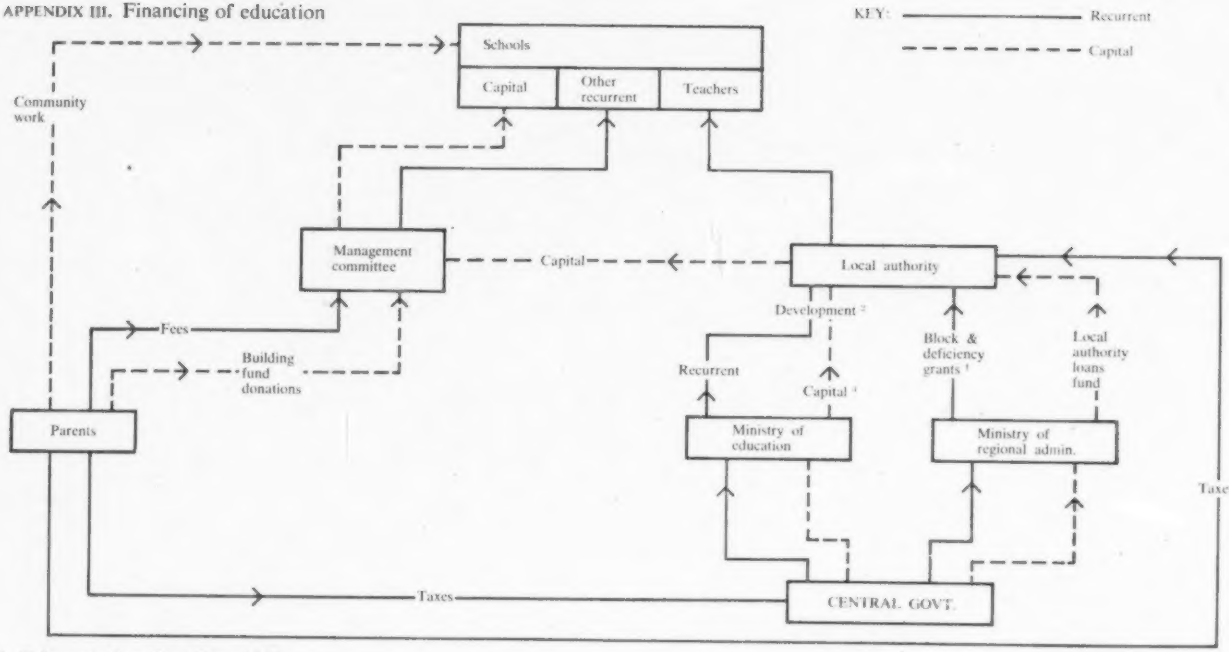
[3] A breakdown is not available. ... Data not available.

1956–66 (excludes vocational schools and Makerere College)

1960	1961	1962	1963	1964	1965	1966
83 542	85 938	87 771	114 879	106 263	115 835	122 326
70 186	72 934	70 957	84 711	94 140	98 264	104 756
64 552	68 841	66 739	88 878	81 806	93 447	99 321
57 470	61 906	60 251	70 091	73 905	80 420	87 740
46 588	51 591	50 996	60 901	64 924	70 642	76 735
40 604	46 008	48 381	57 030	61 432	68 225	73 312
362 942	387 218	385 095	476 490	482 470	526 833	564 190
11 664	14 742	14 276	22 156	23 725	27 066	42 031
8 543	10 626	11 201	16 698	19 390	24 363	27 214
1 134	440	252	309	282	197	111
21 341	25 808	25 729	39 163	43 397	51 626	69 356
2 037	2 017	2 228	3 067	4 100	6 106	6 504
1 581	1 876	1 957	2 529	3 047	4 488	6 057
1 333	1 406	1 799	2 039	2 494	3 099	4 413
1 297	1 147	1 412	1 907	2 068	2 499	3 029
6 248	6 446	7 396	9 542	11 709	16 192	20 003
118	149	270	399	575	608	966
91	104	157	254	368	523	579
209	253	427	653	943	1 131	1 545
867	958	858	934	929	907	849
1 695[3]	1 668[3]	913	908	929	932	913
		849	870	878	878	868
		330	748	797	840	870
2 562	2 626	2 950	3 460	3 542	3 557	3 500
197	369[3]	...	206	189	165	167
147		...	161	203	161	146
...	...	...	39	74	44	49
...	...	...	406	466	370	362
					...	110
					—	93
					—	—
					...	203
					...	23
					...	9
					...	32

NOTE At the end of 1966, the primary-junior secondary system was abolished and the country reverted to a 7-year primary system followed by a 6-year secondary system.

APPENDIX III. Financing of education


KEY:
Recurrent
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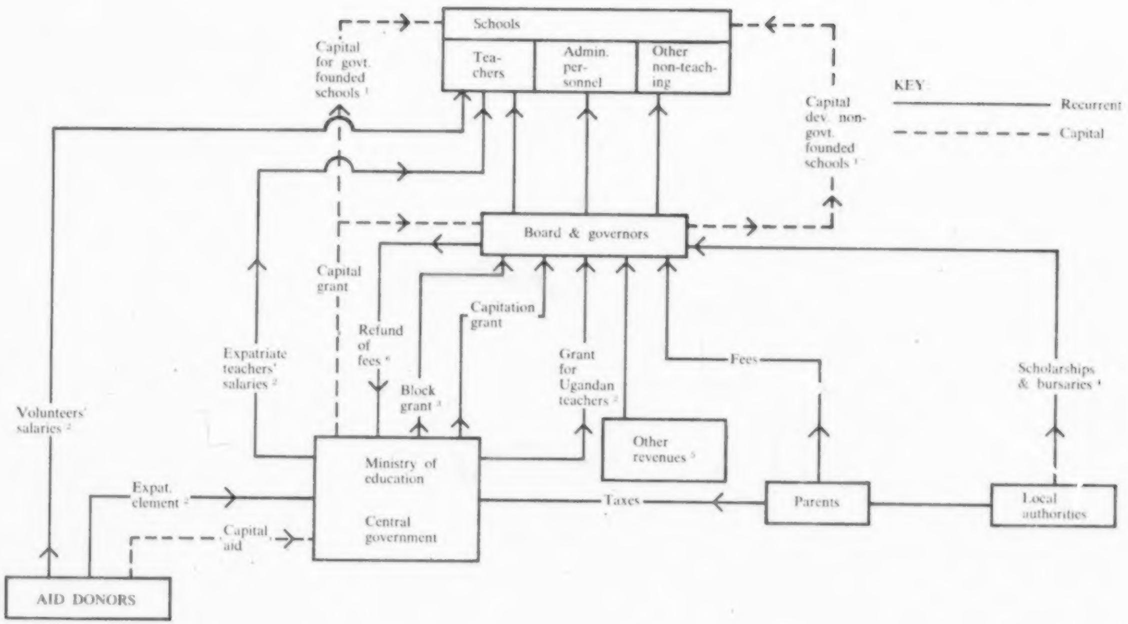
Capital
Other recurrent
Teachers
Community work
Management committee
Capital
Local authority
Fees
Building fund donations
Development ²
Recurrent
Capital ³
Block & deficiency grants ¹
Local authority loans fund
Parents
Ministry of education
Ministry of regional admin.
Taxes
Taxes
CENTRAL GOVT.

1. Primary education (June 1968)

NOTES 1. *Block and deficiency grants*. On an agreed formula the central government gives a grant to cover some of its expenditures on rural health, water supplies, agricultural extension, and primary education. This is called the block grant. If the local authority cannot balance its budget it is sometimes given a deficiency grant. Neither of these is tied to any particular service.

2. *Development teacher grant*. Each year the Ministry of education gives a grant for six months to cover 50 per cent of the salary of Grade II teachers, and 100 per cent of the salary of Grade III teachers. This grant is given from January to June. In July it is transferred (covering the whole year) to the block grant.

3. *Capital grants*. In the past all Grade III development teachers were accompanied by a capital grant.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Board & governors
Capital
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Refund
of
fees 6
Block
grant 3
Capitation
grant
Grant
for
Ugandan
teachers 2
Expatriate
teachers'
salaries 2
Fees
Scholarships
& bursaries 4
Volunteers'
salaries 2
Ministry of
education
Central
government
Other
revenues 5
Expat.
element 2
Capital
aid
Taxes
Parents
Local
authorities
AID DONORS

2. Secondary education (June 1968)

NOTES 1. Capital for government-founded schools is directly the responsibility of the Ministry of education. Capital for non-government-founded schools goes through the Boards of governors.

2. Ugandan teachers are paid through the Boards of governors. Certain volunteers are paid directly by the aid agencies, as well as certain parts of the expatriation pay for teachers. Generally expatriate teachers, as civil servants, are paid directly through the Ministry of education.

3. The block grant for secondary schools is calculated to cover the expenses of the administrative personnel. For other secondary institutions to cover non-teaching overheads.

4. Scholarships are paid by local authorities in lieu of fees direct to schools.

5. Other revenues include such things as donations, revenue from investments and sales, revenue from rent of houses to teachers, etc.

6. Urban day schools have to refund most of the fees they receive to government.

Uganda 20

Behaviour of non-teacher recurring expenditures

prepared by John Chesswas *and* Jacques Hallak

This study has been prepared from materials supplied by the Ministry of education, Uganda. The authors John Chesswas and Jacques Hallak, staff members of the IIEP, were helped in the analysis by Miss Maryanne Höök (Sweden) and Mr. Baudoin Duvieusart (Belgium). The Institute is very grateful to the Uganda government, its Ministry of education and its officials, in particular Mr. David Sentongo, Mr. Conrad Browne and Mr. Brendan McCourt, for all the assistance which has been given in the preparation of this study.

Introduction

The purposes of this study are:

(a) to investigate the behaviour of itemized expenditure controlled by the authorities of individual schools;
(b) to compare and contrast such behaviour between schools of different structures;
(c) to observe the influence on expenditure of personalities concerned;
(d) to attempt to relate unit expenditure on various items to explanatory variables, and
(e) to assess the value of such analysis for educational planning purposes.

With these aims, a study was made of expenditure in secondary schools in Uganda during the period 1965 to 1967. This period was chosen because an attempt was made in 1965 to standardize the accounts of secondary schools for planning purposes.

As will be explained later in this study, teachers' salaries and capital expenditure are controlled by the Ministry of education and depend upon the funds which that Ministry can make available to the schools. The school authorities are therefore not in a position to decide on such expenditure and sometimes can have little influence on it, having to leave the decision-making to the Ministry and to accept what is given to them. For this reason these items are not investigated in detail in the study. They do have an influence on the total flow of funds and to that extent must be included, but the focus of the study is on that part of the school funds which is really controlled by the school authorities, the non-teacher recurring expenditure.

I. Secondary education and the control of expenditure

A. Outline of the educational system

During the period 1965 to 1967 the primary school system was being changed. The previous structure, of six-grade primary schooling followed, after a 40 per cent selection, by two-grade junior secondary, became a seven-grade primary school. Secondary education is divided into two stages, the first of four grades, known as S.1 to S.4, the second of two grades, S.5 and S.6. At the lower stage there are three main types of education: (i) secondary schools of a general type, taking by far the largest number of students at this level, about 30 per cent of the junior secondary leavers; (ii) technical schools and farm schools, the latter only a three-grade course; and (iii) teacher-training colleges for teachers of lower primary grades. At the upper stage the main course is the upper secondary general course which leads to university entrance, but there are also numerous types of vocational courses, most of them run by the ministries or departments concerned.

B. Secondary schools

Secondary schools leading to the university have always been the most popular choice of junior secondary (now primary) school leavers. They offer a general course. At the lower stage English, mathematics, science, geography and history are the main subjects, leading to the Cambridge School Certificate (C.S.C.).

At the upper stage of secondary general education students specialize. They are 'streamed' into two broad categories, science and arts, and in each category each student usually chooses three or four subjects on which to concentrate as his 'principal' subjects. Like the lower secondary course, this stage is heavily examination-oriented. Success in the final examination leads to the award of the Higher School Certificate (H.S.C.).

The entry of students to secondary schools is strictly controlled by the Ministry of education.[1] Almost all secondary schools have large catchment areas and it is therefore inevitable that very often there is no secondary school within daily reach of the homes of those qualifying for entry. This results in a need for boarding facilities, and virtually every school located in the rural areas is predominantly, if not completely, boarding.

As will be seen in this study, the cost of boarding-school education is high and it imposes a severe strain on Ugandan financial resources. In 1967 the situation was particularly difficult. Negotiations for a loan from the International Development Association (IDA) for capital development of secondary schools were taking a considerable time. Expansion related to that capital had already been started in 1965 in those schools with inadequate premises; at the same time further expansion was planned. As a result, in 1967 day pupils were admitted to the first grade of many secondary boarding schools, the premises being used more intensively. Following the negotiation of the loan in 1968, the situation became somewhat easier.

1. *Administration and management of secondary schools*

Each secondary school is managed by a Board of governors established in accordance with rules made by the Minister of education[2] under powers given to him by the Education Ordinance, 1959.

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[1] For more details of the selection system, see J. D. Chesswas, 'Educational planning and development in Uganda', in *Educational development in Africa*, Vol. I, Paris, Unesco: IIEP, 1969.

[2] Uganda Protectorate, *The Board of Governors (Self-Governing Schools) Rules, 1962*, published as 'Legal Notice No. 129 of 1962', Entebbe, Government Printer, 1962.

In practice, the headmaster is the key person in the administration of a secondary school. The meetings of the Board of governors and its sub-committees are by no means mere formalities and often result in action, but each of them only meets two or three times per year. Thus, much of the administration is carried out directly by the headmaster and in co-operation with the Ministry of education, the Chairman of the Board of governors being consulted from time to time.

2. *Receipts, expenditure and accounts of schools*

The rules go into some detail about the financial aspects of the management of schools; more than a quarter of the rules lay down the rights and duties of boards in this respect.[1]

3. *Financing of the secondary sector*

The main sources of finance for the secondary sector are government and pupils' fees for recurring purposes, and government grants for capital purposes. Some grants, however, are tied to particular purposes.

One important item of finance never, in fact, passes through the school accounts. Section 12 (c) of the Rules provides for the secondment of public officers to the staff of a school. These officers are usually expatriate teachers recruited under various aid schemes, and they are paid either directly by the Ministry of education or by the aid agency, or both. The school accounts therefore reflect only part of the flow of funds directly connected with the running of its service.

However, the salaries of Ugandan teachers and some missionaries are paid to them as members of the Uganda Teaching Service and do not pass through the school accounts.[2]

The recurring grants which the Ministry makes to Boards of governors of secondary schools are: (i) salary grants in respect of members of the Uganda Teaching Service; (ii) block grants as a contribution towards the salaries of non-teaching staff; (iii) a 25 per cent contribution towards the wages of unskilled labour;[3] and (iv) capitation grants per student. The rates of capitation grants are shown in Table 1.

TABLE 1. Annual rates of capitation grants payable by the Ministry of education to boards of governors of secondary schools (in Ugandan shillings)

	Boarding	Day
C.S.C.	450	200
H.S.C.	800	400

NOTE There is no difference between rates for males and females.

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1. Sections 15 to 22 of the Rules.
2. At the time of writing a new Teaching Service Commission, which is to be the employer of all Ugandan teachers, is being formed, and by the time this is published the above information may be out of date. However, it did apply during 1965 to 1967, the years with which this study is concerned.
3. Introduced in 1966 as a result of the general raising of the legal minimum wage.

Boards of governors are allowed to remit fees of individual needy students either in whole or in part up to a total of 5 per cent of the gross fees receivable. However, some urban day schools have a peculiarity in their fee structure. Before the promulgation of the Boards of governors rules certain day schools were directly administrated by the Ministry and their accounts were run as government votes. Their fees were not directly related to estimated expenditure and were paid as government revenue. When these schools were handed over to Boards of governors, this anomaly was rectified by leaving the rate of fees unchanged, but requiring the boards to collect them and hand them over to the government. The government then reimbursed the boards to the extent of the standard capitation grant. However, other day schools not originally founded by government used to charge higher fees than the government schools. When Boards of governors took over these schools they only had to return to the government fees at the level collected in the government-founded schools.[1]

To sum up the recurring income and expenditure situation, the position is as follows:

(i) *Teachers*

(a) public officers, directly paid by the Ministry or aid agency;

(b) Uganda Teaching Service, paid by the Board of governors from a tied grant;

(ii) *Other personnel*

A contribution is given by the government to the Board of governors in the form of a block grant and a 25 per cent contribution to the wages of unskilled labour. The remainder comes from (iii);

(iii) *Remainder of 'other personnel' and other recurring expenses*

A combination of capitation grant, fees and other income.

Although a school may get some small gifts and contributions from non-government sources for capital expenses, to all intents and purposes capital expenditure is financed by the government, either from its own funds or from grants or loans which it receives from external aid.

C. Control of expenditure

As for administration so for the accounts; the headmaster is the key person in the control of expenditure. About the middle of the year he begins work on the draft estimates for the following year. He knows what enrolments are to be and he can therefore estimate recurring income. He also has his current and recent budgets to provide a general guideline to expenditure. He consults his staff about the requirements of the various departments and sectors for which they are responsible and draws up a proposed income and expenditure budget for recurring expenditure. Capital expenditure for development constitutes part of a development plan and this he must discuss with the planning officer at the Ministry of education. Unless he is fortunate enough to have sufficient savings or a generous benefactor (not a common situation!) replacement and/or improvement capital must also be discussed with the planning officer.

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[1] School I (h) falls in this latter category and thus has a higher income per pupil than the other day schools in the sample.

Towards the end of the year the Board of governors formally approves the estimates, amended if necessary, and they are sent to the Ministry for approval. The recurring items are dealt with by an officer of the secondary section and the capital by the planning officer. Once they are approved, they come into operation at the new year. The auditor or his representative visits the school about once a term to help the bursar, who is the headmaster's financial right-hand man, and advise generally. He either draws up, or helps to draw up, the final statement of accounts for the previous year, which he then formally audits. It is then, early in the next year, sent to the Ministry.

D. The origins of the new accounting system

In 1964 and 1965 two groups were set up by the Ministry of education to investigate and make recommendations on secondary school costs and accounts. They were (i) a Working Party which conducted a costs survey of secondary schools and (ii) a Committee on the Reform of Secondary Schools' Accounts.

(i) *The Working Party for the Secondary Schools Costs Survey.* In accordance with its terms of reference, this working party submitted a report. A summary of its findings and recommendations is shown in Appendix 1 to this study.

(ii) *The Committee on the Reform of Secondary Schools' Accounts.* Following the report of the working party a committee was set up to make recommendations on the revision of the secondary schools' accounting system. In its report the committee proposed a form of accounting designed 'to produce a functional classification of educational expenditures, to facilitate a better understanding of the present cost structure of education and to assist forward planning . . .'[1]

The essence of the system is summed up in the following quotation from the report:

> 'In principle, there are two alternative ways of classifying a school's expenditures. The first of these would analyse costs according to the *type of resources used* (e.g. labour paid for by wages and salaries, materials, and capital equipment, the financial cost of which is depreciated). The second approach divides costs according to the *purposes* to which resources of all kinds have been put by the school (e.g. living costs, tuition, administration, etc.). More illuminating than either of these by itself, is if these two kinds of analysis are *simultaneously* performed within the framework of one table. This, in fact, is what we are attempting in Appendix 1 . . .'[1]

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[1] Uganda, Ministry of Education, 'Report of the Committee on the Reform of Secondary Schools' Accounts', Kampala, February 1965, unpublished, p. 6.

The 'Appendix I' referred to is reproduced as Appendix II to this study.

The report deals in considerable detail with problems of definition and makes suggestions regarding arbitrary allocations and divisions between items which have to be made in difficult cases. It sets out a model accounting system designed specifically to meet the needs of the secondary schools. It also makes suggestions about training the personnel who have to operate the scheme.

II. Initiation of new accounting system

A. Feasibility

As in other countries, there are in Uganda private firms of professional auditors who carry out audits for industrial, commercial and other organizations for which they are paid fees. In Uganda they are also prepared to help with the layout and the functions of accountancy systems and to advise bursars, accounts clerks and others who keep the day-to-day accounts of the schools. The schools cannot as yet attract qualified accountants into such posts, but the people occupying them usually have sufficient accounting ability to be able to carry out the job satisfactorily with professional advice and supervision. These circumstances have made it possible to introduce a reasonable degree of standardization into secondary school accounts.

B. Variations from the recommendations of the Committee on the Reform of Secondary Schools' Accounts

The system which has been adopted is only partly in accordance with the Committee's recommendations. From the point of view of educational planning, there are three important variations: (i) the lack of distribution of expenditure on tuition between the lower and upper stages of secondary education and upper science and arts (with one exception); (ii) apart from the fact that some schools put funds into a depreciation account for a vehicle, and a very few into special building reserve accounts, there appears to be no provision for depreciation; and (iii) although salaries and transport are separate items, they are not allocated to purposes, as the Committee recommended, apart from the separation of salaries of teachers, skilled non-teaching personnel and unskilled personnel.

There is no 'administration' head, but items which would normally be classified under that head appear under a 'miscellaneous' head. This latter also includes 'library/reading room' in most cases, which the Committee classified under the 'tuition' head. (They implied this by classifying the librarian with the teaching staff).

The 'maintenance and repairs' head has added to its title 'and upkeep'. The 'electricity' item is not sub-divided as the Committee recommended, but is usually classified as a total under this head. However, fuel is classified under 'boarding' ('living') and this presents a difficulty only where electricity is obviously used for cooking as well as other purposes.

There is no separate 'medical' head as recommended by the Committee. Day schools show no expenditure on this item and boarding schools classify it under 'boarding' ('living'). Expenditure on this item is usually so small that this practice might well be justified.

III. The study of school accounts

A. Choice and characteristics of the sample schools

The choice of the schools to be covered in the sample was dictated by practical considerations. The only schools which could be considered were those for which a set of accounts was available for the whole of the three years 1965 to 1967 in a form lending itself to the type of analysis desired. As the new accounting system had only just come into operation there were inevitably deficiencies in the information available from some of the schools. A sample of 11 schools was taken, the characteristics and basic data of which are shown in Appendixes IV and V.

The geographical distribution of the sample is as follows:

5 out of a total of 22 in the central (Buganda) region
3 out of a total of 16 in the western region
2 out of a total of 16 in the eastern region
1 out of a total of 12 in the northern region
11 out of a total of 66 in the whole country.

The sample includes 4 of the 17 schools in the country with classes at both stages (S.1 to S.6) and 7 of the 49 with classes only at the lower stage (S.1 to S.4).

There are four urban day schools, of which two are in the largest city. One school is a predominantly day school in a thickly populated rural area and six are rural or quasi-rural boarding schools, most of them with a few day students, especially in 1967. Of the 4 urban day schools, 3 have double sessions at the lower stage. Of the 11 schools, two are for girls, three for boys and six mixed.

Comparing the statistics of the schools in the sample with those for all the 66 government and aided schools which existed in 1966, the middle year of the three under consideration, enrolments in the sample were about 24 per cent of the total, salaries paid to teachers about 26 per cent and other recurring expenditure over 20 per cent.

Thus the sample, although not truly random through force of circumstances, is representative and covers a sufficiently large proportion of the secondary school system to enable the analyst to extract general lessons. Yet for the purpose of correlating the behaviour of unit costs with explanatory variables the restricted size of the sample imposes limitations. With the possible combinations of (i) upper and lower stages, (ii) boarding and day, (iii) single and double sessions, (iv) science and arts at the upper stage, (v) boys', girls' and mixed schools, (vi) location in four regions, there are more theoretically different structures than the 66 public and aided schools which existed in 1966. However, a complete coverage of the various possible structures is not indispensable, and as is seen later an interesting set of general results was obtained from the 11 schools studied.

For the purpose of this study we have given the schools in our sample a simple code which will help the reader identify the major factors that might influence non-teacher recurrent costs.

Each of the schools is first designated by a capital letter depending on its total enrolment in 1967, school A being the smallest school, and school K being the largest school. Newly opened schools which do not in 1967 even have classes at the four forms S.1–S.4 have this code letter in italic type (i.e.*A*). The oldest, élitist and best established schools are designated by bracketing the code letter as follows: [E]. Schools that have higher forms are designated by (h). Schools that run double shifts are designated by (d). Schools that are predominantly boarding are designated by (b).

Thus school C is a reasonably small predominantly day school, operating on one shift classes at the lower stage only. It is neither a new school, nor a particularly old-established school. School [E] (bh) is a medium-sized old-established boarding school, operating on one shift, with forms at the two stages S.1–S.4 and S.5–S.6, etc.

B. Limitations of the study

The study concentrates on the behaviour of expenditure controlled by the school, contrasting such behaviour as between schools of different structures and trying to assess the influence of the personality of the headmaster on patterns of expenditure. Teachers' salaries are therefore omitted from the detailed study, since, as has already been said, the school has little influence over them.

Annual expenditure on individual items can be 'patchy' and fluctuate considerably. Certain items such as food are likely to be fairly regular, though to some extent fluctuating with the market situation. Others, however, such as textbooks, are much more controllable, but also show greater annual differences.

One year's accounts are not very useful as a guide to expenditure patterns item by item. To get a reasonable picture one would need about a five-year time sequence to average out such fluctuations. At the time that this study was undertaken, only three years' accounts were available, but even in that limited period there are signs of an averaging out and they probably do yield information on which one can base some tentative conclusions.

C. Income

1. *Classification : recurring and capital*

The reports of the working party and committee described earlier make a clear distinction between recurring and capital expenditure, and in fact go a stage further in depreciating capital assets as an element in recurring costs. Likewise the Ministry of education, in its grant system, makes a clear distinction between the two in accordance with government procedure, which votes funds for recurring and capital purposes completely separately.

However, there are areas in which the division between capital and recurring expenditure for a particular item is moot. In the present context this applies particularly to items of school equipment such as library books, textbooks and scientific equipment. When a school develops by the addition of a class or classes, the Ministry's capital grant pattern allows a sum for the purchase of a complete set of textbooks for such classes and another for additional library books because of the increased need arising from the larger number of students. The same principle applies to the addition of new science laboratories and practical rooms, an initial capital sum being given for the complete equipping of those rooms. However in all cases the school is then expected to take on the replacement of consumed, broken or worn-out items from its recurring income.[1]

2. *Recurring income*

In the description of the control of expenditure it was pointed out that the headmaster can estimate recurring income. This he can do fairly accurately, because (i) the capitation grant and fee rates and maximum remission of fees are all fixed and he only has to apply the current rates to arrive at a fairly accurate figure; (ii) the block grant is fixed according to the size of the school, in a few cases to its historical circumstances, but nevertheless fixed; (iii) the 25 per cent contribution to the wages of unskilled staff is provided for an approved number of employees; and (iv) other income is usually negligible in relation to (i) + (ii) + (iii). In Appendix VI the income per head from each of the above sources in shown. From this Appendix it can be seen that school I(h) and school C have much higher income from fees than other day schools. This is because school I(h) charges higher fees than most day schools, and school C, though mainly a day school, has some boarders, and is thus not expected to refund fees.

This means that there is a clear limit beneath which the headmaster can manoeuvre in estimating and operating his expenditures.

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[1] For the grant rates allowed for this purpose, see J. D. Chesswas, op. cit., Appendix B.

D. Expenditure

Recurring and capital expenditures are likewise clearly distinguished in the two reports. In general they are separated in the school accounts, except for the common practice of treating the grants for library and textbooks for new classes, and in a few cases science equipment and furniture, as recurring income and showing expenditure on each of these items under the recurrent heading.

However, there are two other factors which must be taken into account. The Committee on the Reform of Secondary Schools' Accounts allowed for depreciation. As has already been mentioned, a number of schools have started a physical cash depreciation of vehicles from recurring funds by putting aside a sum each year into a depreciation account so as to be able to replace their vehicles at intervals of about four years. In a few cases schools have put aside, also from recurring funds, sums for buildings, some of them specifying the buildings they wish to erect.

The other factor is what, for want of a better term, is called 'extraordinary' expenditure. This has been used to cover such cases as a subsidy for rent for teachers at school I(h) in 1966 and 1967 during a temporary shortage of housing, emergency repairs to the roof at the same school, a once-occurring small item for 'boarding fees' at school K(d) and an apparent subsidizing by school [G](bh) from its own recurring income of the boarding expenses of students at a neighbouring school, presumably by feeding them without charge. In every case the expenditure is not what one would expect to be normal expenditure, and in every case it comes from recurring income. It is separated so that the comparison between schools can be of normal expenditures.

E. Comparison of income and expenditure

Appendix VI compares the total recurrent income per pupil over the period 1965–67 with the total non-teacher non-boarding expenditure per pupil. The average total cost per pupil (including boarding cost and meals provided for day students) and the average total recurrent cost per student including uniforms are also shown.

The reason why the uniform cost has been separated out is because different schools have different methods of dealing with uniforms. Some schools make no provision for uniforms, some show in the accounts only the net cost to the school (i.e. ignoring the pupil's own contribution), whilst others show the whole cost of the uniforms.

The detailed beakdown of the non-teacher non-boarding cost is shown in Appendix VI, together with the detailed breakdown of the sources of recurrent revenue.

Most schools in the sample used some of their recurrent revenue for special, or capital, purposes. School C, for instance overspent during the period by about 5 per cent because of a considerable use of recurrent funds for capital works.

Similarly with school I(h). School F(b) spent about 100 per cent of its recurrent revenue, again due to a transfer to the capital budget, and school[G] (bh) overspent in total.

Thus in general it can be said that whatever the actual recurrent expenditure, schools tend to find ways of using most, if not all, of their recurrent revenue.

IV. Interpretation of results

A. General

Taking the general situation first, Table 2 shows the order of magnitude of the cost of the different activities of the schools, grouping the schools into predominantly or completely day and boarding schools. The average is obtained for 33 values (3 years × 11 schools) of the sample.

It is clear that expenditure on non-teaching staff and tuition are the largest items in day schools, whereas in boarding schools the boarding element is by far the most important cost factor.[1] At the other extreme, in both categories expenditure on transport and travelling constitutes a negligible proportion of total recurrent expenditure. Inevitably these percentages, being averages, vary from school to school over the years.

The question to be answered is how this distribution of expenditure changes and in relation to which factors.

It will be approached from two different angles. Firstly, an attempt will be made to identify factors which in principle would be expected to influence the non-teacher costs. Secondly, the accounts of the eleven schools will be examined to see what factors did in fact influence costs, and why costs did not always vary as they would be expected to.

B. Factors that would be expected to influence non-teacher costs

In the system of costing for the eleven schools, an attempt was made to include in the cost for each school an indication of all the factors that were most likely to influence costs.

The factors identified by the code descriptions given previously are those which would be expected to have the greatest influence on costs. Each of these factors will be dealt with in turn, and the likely effects that they would have on each of the headings in the Table 2 will be pointed out.

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[1] Excluding teachers' salaries, of course.

1. *Day/boarding*

It would be expected that expenditures per pupil for all the headings in Table 2, except those for tuition, would be higher in boarding schools than in day schools.

Expenditures for non-teaching staff would be higher, as the clerical, cleaning and maintenance tasks in a boarding school are more extensive. Expenditures on maintenance would tend to be two or three times higher than in a day school. Expenditures on administration would be somewhat higher in a boarding school, as there would be administrative tasks related to the boarding. Expenditures on transport, both for staff and students, would be marginally higher, as boarding schools are generally in more remote areas than day schools. Finally, of course, only boarding schools have expenditures under the boarding heading.

TABLE 2. Average expenditure in eleven specimen schools by head by day/boarding

	Day		Boarding	
	Percentage of total	Average unit shs.	Percentage of total	Average unit shs.
Non-teaching staff	30.0	70.40	15.0	161.70
Tuition	41.7	97.90	15.9	170.40
Maintenance	18.9	44.40	13.0	139.20
Administration	8.1	19.00	5.6	60.20
Transport	1.3	2.90	4.8	51.70
Boarding	—	—	45.7	490.30
Total	100	234.60	100	1 073.50
Enrolment	10 053		5 561	

From Table 2 it can be seen that, on average, the costs of boarding schools are slightly higher than would be expected. For example, the tuition cost per pupil is almost twice as high in boarding schools as it is in day schools, and the administrative costs per pupil are three times as high. In theory, such large differences would not be expected.

From a purely economic viewpoint, it appears that there is too much concentration on boarding-school education in Uganda. In the following paragraphs we will discuss a simple methodology for deciding where boarding education is more economical than day education. We are, of course, aware that there are other non-economic criteria which must play a part in any day/boarding decision.

Excluding expenditure on tuition, the totals in Table 2 for all other items are 903.10 shs. for a boarder and 136.70 shs. for a day student. The Working Party for the secondary schools costs survey estimated that amortization of capital is approximately equal to the total of the expenditure elements contained in Table 2.[1] Thus one could say that the additional sum entailed in boarding education as against day is (1,073.50 shs. + 903.10 shs) − (234.60 shs. + 136.70 shs.), less an estimated 200.00 shs. for mid-day meals for 5 days per week (including amortization), or approximately 1,400 shs. per student per annum. Thus, leaving aside the practical aspects of the problem and concentrating solely on the financial aspects, if the average total public cost of transporting a student from his home to his school is less than the sum of 7.80 shs. per day for the 180 working days per annum, day schooling plus transport is cheaper than boarding. If the government, decided to eliminate the boarding-school system and develop only day schools, theoretically a network of such day schools could be established on the basis of the maximum distance between establishments beyond which boarding becomes cheaper than 'day plus transport'.

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[1] Ministry of Education, Uganda, 'Secondary Schools Costs Survey', Kampala, Report by Working Party, 1964, p. 2.

In principle we should include here, in addition to the direct public cost of transporting pupils, the indirect public transport cost (by way of subsidized transport, for example) and the transport cost borne by the families of day pupils. However, the boarding system provides not only sleeping facilities but also meals for pupils, and one should bear in mind that a day system means that pupils are supported by their families. It is therefore necessary either to add to the 'day plus transport' the food cost or to deduct from the boarding cost the cost of feeding the pupils. We have chosen the latter formula, in order to present our argument in a satisfactory way.

In comparing boarding and day schools in this way, the additional expenditure entailed by boarding education as against day is approximately 1,140 shs. per student per annum. Thus, if the average total economic cost of transporting a pupil from his home to his school is less than 6.50 shs. per day, then day schooling plus transport is cheaper than boarding. Assuming, for example, that the transportation cost supported by the economy is equivalent to 0.1 shs. per mile per student return (with a 50-seater bus costing about 60,000 shs), a day school can economically serve pupils who are living up to a distance of 65 miles; beyond this distance, it is necessary either to replace the day schools by boarding schools and provide boarding facilities, or to build new day schools. We have assumed that there is no opportunity cost of the students' time.

2. *Single/double shift*

Generally speaking, the argument for the double-shift operation of schools depends on the fact that such an operation enables a much greater utilization of the capital facilities in a given school. For any given capital expenditure almost twice as many students can be enrolled if the school is run on a double-shift instead of on a single-shift basis.

However, small but significant savings in recurrent expenditures can also be expected. The cost per pupil of cleaning the school premises is likely to be considerably less with double shift operation, there would also be some saving on the maintenance heading as the physical plant per student enrolled is less, and finally, a small saving could be expected on the tuition and the administration heading, as some of these expenditures are related more to the physical plant than to the number of students.

From Appendix VI it can be seen that the expenditure on all heads in the three double-shift schools is lower than in all other schools. However, as we will argue later on, it is not necessarily true that all the apparently low expenditures in these three schools are due to double-shift operation.

3. *Low-level/high-level courses*

It would be expected that a school offering courses at the H.S.C. level as well as at the C.S.C. level would have slightly higher expenditure per pupil on tuition, and also marginally higher expenditure per pupil on maintenance. This would be expected as the class size at the higher level is smaller, and the proportion of the students' time spent on specialized subjects, requiring special facilities and equipment, is much greater.

However, because of the influence of other factors, and the relatively small numbers of pupils taking H.S.C. courses at any one school, the influence of this factor is not apparent in our sample schools from the per-pupil cost figures in Appendix VI.

4. *Economies of scale*

It would be expected that, all other things being equal, the larger the school the lower the unit expenditure on all headings because of economies of scale, particularly in respect of the administrative costs, the costs of non-teaching personnel, and the costs of transport.

In looking at the figures in Appendix VI there does not seem to be any clear relationship between the size of the school and the expenditure on any particular head. The largest schools do in fact have the lowest unit expenditure on all heads; however, these large schools are also those which are run on a double-shift basis.

Using school B(b) as an example, its enrolment trebled from 1965 to 1967—from 62 to 192—while unit costs fell by 17 per cent (1,266 shs. to 1,084 shs.). On the other hand, in 1967 the enrolment expanded by only 46 per cent yet unit expenditure fell by 21 per cent—a reduction brought about not only by economies of scale but also by a more than proportionate increase in day students. In school D(b) unit cost was reduced by 34 per cent between 1965 and 1967, when enrolments increased by over 60 per cent. To quite a large extent the reduction can be accounted for by an increase in the proportion of day students—from 1 to 21 per cent.

5. *Age of school*

Because of the influence of economies of scale mentioned above, it would be expected that unit expenditure in new schools which are not yet fully developed would be higher than average unit costs. For example, even though school buildings are not being fully utilized they still have to be cleaned, even though teaching rooms are not fully used they still have to be equipped, and even though the school has not reached its full enrolment, auditors, accountants and cooks still have to be employed.

However, because of the influence of other factors the two new schools in our sample do not seem to have particularly high unit expenditures on any head.

It would also be expected that the older established élitist schools would have higher unit expenditure figures than normal, partly because they are accustomed to higher standards, and partly because the costs of maintenance of the old buildings would be higher.

There are two élitist schools in our sample, and in both the unit expeniture on maintenance is very high. However, on the other headings one of these two schools, school [E](bh) does seem to have extremely high over-all expenditures, the total non-teaching unit expenditures being 25 per cent higher than in any other school, whilst the other well established school in our sample, school [G](bh), appears to have quite normal unit expenditures.

C. Factors which have influenced unit costs in the sample schools

Ideally the logical way to examine the impact of each factor on the level of unit costs is to make a multi-correlation analysis between unit cost and the various key factors considered. If the correlation is high between, for example, unit cost and the structure of the school, it is then possible to estimate the regression equation relating the unit cost to this factor. But to carry out such an analysis would necessitate considerably more data than are available at the present time.

In the previous section we have drawn attention to those factors which might be expected to influence unit costs, and indicated whether these factors have in fact affected the costs or not. In this section we will attempt to be more definitive, and will give our interpretation of why the unit cost in the sample schools is so different. (See Appendix VI).

From detailed study of the figures in the sample schools, it appears that two major factors and several minor ones have influenced unit expenditures.

1. *The influence of income on expenditure*

In principle there should not be a close relationship between income and expenditure, since the main source of income, the government, can presumably decide independently to raise or reduce its contribution, especially if the budget of the Ministry of education comes under financial constraints. After all, it has the power to reject a school's estimates.

In reality the problem is not so simple. The interacting influences of income and expenditure are very complex and illustrate the cumulative effects of political, sociological and economic factors which are difficult to isolate. From the analysis of the sample schools it is possible to show a few interesting examples of such influences.

Firstly, from Appendix VI it can be seen that the higher the income per student the higher the expenditure. For example, school J(hd) had an average expenditure per pupil of 195.18 shillings, whilst school I(h) had an expenditure of 420.26 shillings, i.e. more than twice as high as that of school J(hd). Both are large day schools in urban areas, and both have classes at the H.S.C. level. The only difference between the two schools is that school J(hd) is run on a double-shift basis, and is slightly larger than school I(h). The difference in unit expenditures can certainly not be explained by these factors alone. It appears that the main reason for the difference in the unit expenditures of these two schools is the difference in income. School I(h) for historical reasons charges higher fees than most day schools, but only has to refund fees to the Ministry of education at the normal rate for day schools. It therefore has a significant income from fees. Appendix VI shows the other sources of revenue and under all heads school I(h) receives more than school J(hd). It also appears that the rate of capitation for double-shift schools has been reduced by about 25 per [illegible] he normal level for single-shift day schools.

In total the revenue of school I(h) is more than twice the revenue of school J(hd), and thus quite obviously the headmaster of school I(h) plans to spend more than twice as much as the headmaster of school J(hd).

If one looks at expenditure on tuition it can be seen that this varies from 61.27 shillings for school H(d) to 228.58 shillings for school F(b). Both the schools are medium-size schools with classes only at the lower level. Though H(d) is a double-shift day school and F(b) a single-shift boarding school, such a large difference in unit expenditure on tuition would not be expected. The reason for this large difference again seems to be the differences in income, school F(b) having almost five times the income per student of school H(d); even the unit capitation grant for school F(b) is more than three times the grant for school H(d).

As was mentioned above, such large differences in the tuition cost between day and boarding schools would not be expected, nor would large differences between the unit tuition cost in single- and double-shift schools. The wide range of unit non-teacher non-boarding expenditure, from 195.18 shillings for school J(hd) to 708.00 shillings for school [E](bh), cannot be explained merely in terms of the structure or the type of school, but must be largely due to the equally large differences in per-pupil income.

It is true to say that the present system of financing secondary school non-teacher costs favours boarding schools rather than day schools, favours the well-established schools rather than the ordinary schools, and favours schools that operate on one shift rather than those that operate on a double-shift basis.

Even though boarding schools charge fees which either cover or more than cover the boarding cost, they also receive considerably higher capitation, block, and unskilled workers' grants. Similarly the double-shift schools in our sample receive a capitation grant lower than that given to the single-shift day school. And in the case of one day school which charges high fees (I(h)), it is allowed to keep a large proportion of the fees it charges, whilst the double-shift schools have to refund virtually all their fees to the government. Again, the well-established school

[E](bh) not only charges the highest fees of all schools, but also receives the highest per-pupil capitation and block grants, and the largest donations.

It is clear that the effect of total income per student on total unit expenditures is so great that it masks the effect of many other influences; every headmaster is both trying to get as much revenue as possible for his school and is spending virtually all his income. Some schools are of course making transfers to their capital budget for instance school C.

2. *The effect of personalities on expenditure patterns*

Why should school F(b) have the highest unit expenditure on tuition, and one of the lowest expenditures on administration, or why should school *B*(b) have the lowest unit expenditure of all boarding schools on tuition, and the highest unit expenditure of all schools on non-teaching personnel? School F(b) and school *B*(b) have almost the same income but their expenditure patterns differ considerably, much more than could be explained by their differences in size and by the fact that *B*(b) is a new school—both are boarding schools with enrolment only at the lower level.

The only realistic explanation for these and many other differences is that the headmasters at different schools have different priorities, and that within any particular income bracket different headmasters will spend their income on different heads.

As an example of the effect personalities can have on expenditures on a particular head, we will take the expenditure on textbooks per pupil in school I(h). The expenditures on textbooks were as follows:

1964	6.42 shs. per pupil
1965	19.93 shs. per pupil
1966	63.12 shs. per pupil
1967	73.14 shs. per pupil

The leap in 1966 was due to three main factors: (i) a new commerce course, which necessitated new books in 1966, 1967 and 1968; (ii) the introduction of a changed mathematics course needing different textbooks, and (iii) a change of policy for the English syllabus in S.4, *decisions taken by the headmaster in consultation with his staff.*

3. *Other factors*

Apart from the necessarily higher expenditures per pupil in boarding schools on boarding, administration, maintenance and non-teaching personnel, and the savings on all heads from running a school on a double-shift basis, few other factors can be seen to affect the per-pupil cost in our sample schools. This is not because other factors cannot, or do not, affect the unit costs, but because the possible effects are hidden by the much larger influences of income and personalities on per-pupil expenditures.

A few smaller influences can be seen. These appear to be economies of scale

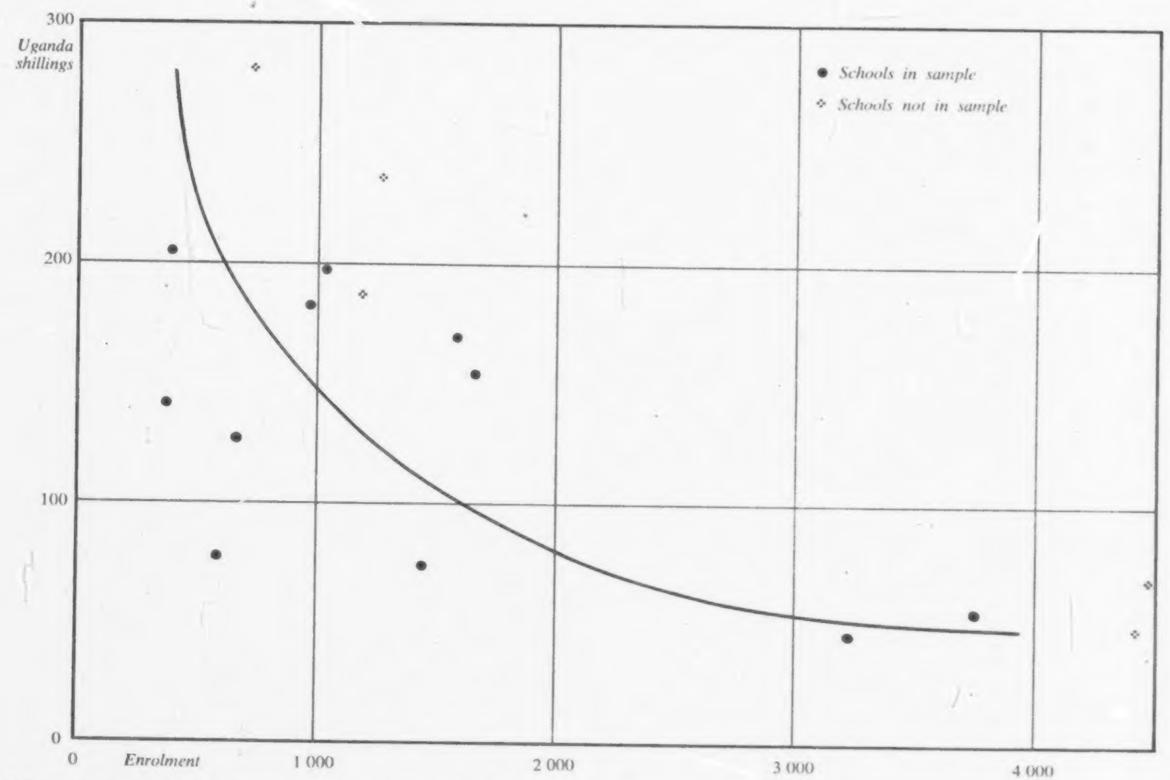

FIGURE 1. *Non-teaching unit costs in relation to enrolment.*

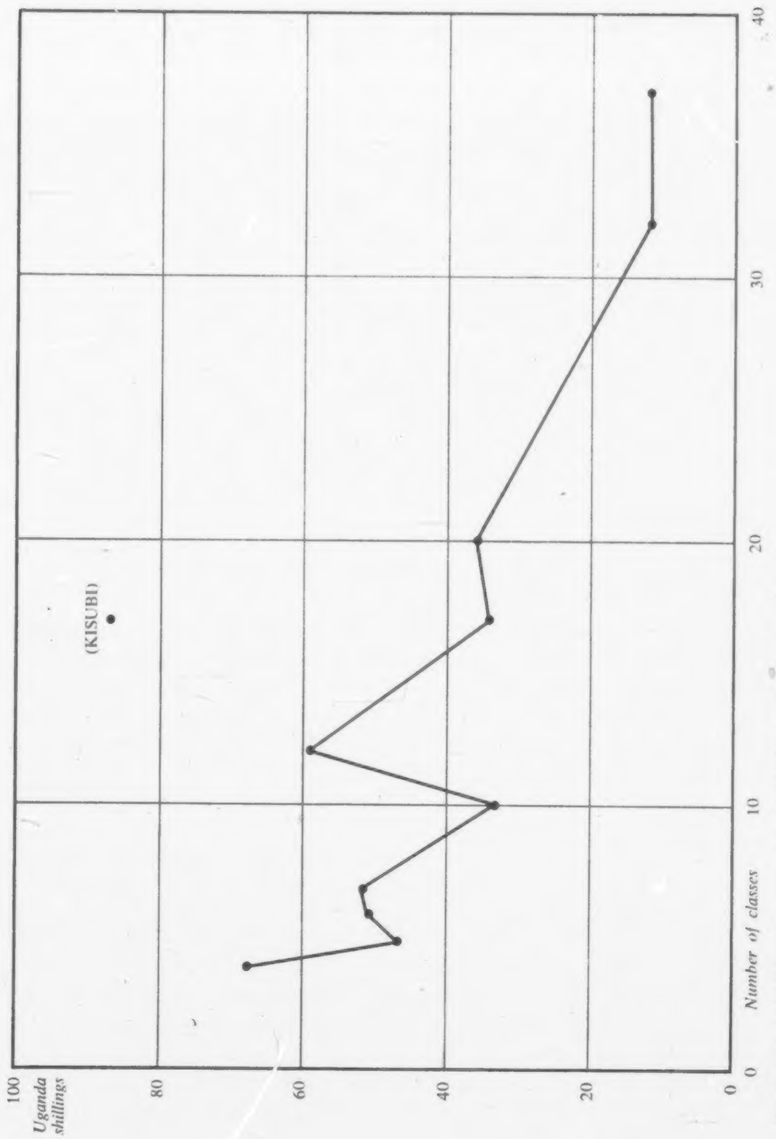

FIGURE 2. *Administration unit cost in relation to number of classes.*

in respect of non-teaching staff. This is illustrated in Figure 1, which includes five other schools in addition to the eleven of the sample. It would appear that a noticeable saving occurs when the enrolment increases from 300 to 1,300, but after that economies of scale become less significant.[1]

There also appear to be some economies of scale in the administrative cost per pupil. While there is no convincing relationship between the unit cost of administration and enrolments, there does seem to be a more satisfactory correlation with the number of classes. Figure 2 shows that, with the exception of school [G](bh), there is a significant decrease in unit expenditure when the number of classes increases. This result is to be expected but it is interesting to have it supported.

Apart from these factors and a few other minor ones such as the fact that schools with classes at H.S.C. level seem to have higher unit library costs than average, that new schools and rapidly expanding ones experience a fall in unit costs as they expand to their fully planned capacity, and that boarding cost appears to be related to the area in which the school is situated, no other conclusions can be drawn from the data available.

V. Conclusions

A. Classification of accounts

No school has fully succeeded in implementing the recommendations of the Committee on the Reform of Secondary Schools' Accounts. Yet there is a certain standardization, and this study shows that accounts in their present form are of some help for planning purposes. Generally speaking, they permit a limited analysis, cross-classified in the manner of Appendix VI. This has been achieved by generally untrained bursars and clerks, supervised by high-quality headmasters who themselves may know little about accountancy, with the professional advice and help of qualified auditors. It has cost little.

Such a standard of accounting can therefore be achieved, and is well worth the small cost. Details arising from the study of the accounts of one or two schools indicate that further classification to the extent which is required could be possible with the same facilities. One would particularly like to know the differences in cost between C.S.C. and H.S.C. level education, the differences in cost between art and science specialization, and the differences in the education of boys and girls. Undoubtedly, it would not always be easy to decide on allocation or division of particular expenditures, and it would be well worth while to study the complete invoices, vouchers and receipts supporting the accounts of the schools to see to what extent it would be possible to allocate expenditures to the appropriate items.

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1. A very crude average is that for an increase in enrolment of 400 students, the unit cost is reduced by 20 shillings.

B. The advantages of analyses of this nature for educational planning

Cost analysts normally take the attitude that teachers' salaries, because they are the most important element in total recurring expenditure, are especially worth studying for the purposes of educational planning. A rough calculation based on all cash outgoings in respect of recurrent expenditure on public and aided secondary schools in Uganda shows that the ratio of all expenditure in respect of salaries, gratuities, passages, etc., of expatriate teachers, to all other recurring expenditure is between 60:40 and 55:45. The weight of the non-teacher element is therefore large enough to make study of it worth while. It has been singled out for examination in this study, and several key issues for educational planners have become evident.

The study (a) challenges a few generally accepted economic rules; (b) illustrates, by giving examples, the unit cost behaviour in relation to some explanatory variables; and (c) can help in making decisions on the structural development of the educational sector.

Challenging generally accepted rules

Educational economists often demonstrate that, due to more and more financial constraints, teachers' salaries increase at the expense of other non-teaching recurring costs. In the case of Uganda, as has been developed in another case study,[1] it is true to say that financial limitations have become increasingly severe, yet the accounts used in this study which take into consideration *national sources* (additional salaries and expenses of expatriates excluded) do not support the above statement. There does not seem to be any substitution phenomenon between costs of salaries and non-salary costs supported by national financial sources.

Another problem which faces educational planners when considering extensions to the educational system is whether to provide day- or boarding-school facilities. This case study illustrates how the problem might be faced using economic arguments.

Improving the efficiency of boarding schools is sometimes put forward as a way of reducing educational costs. But food costs constitute an important proportion of this item and are extremely difficult to reduce—one cannot go below certain minimum dietary standards. One should therefore bear in mind that 'improving efficiency in boarding' can often be more a slogan adopted by theorists than a realistic target set by practitioners.

Illustrating unit cost behaviour

There is no need to summarize all the results of the analysis of unit costs. The first point that should be underlined is the key role played by non-economic factors in the level of total and unit costs, i.e. traditional, institutional (legislation, Board of governors) and essentially human factors (headmaster and his staff). Secondly, structural factors such as size of school, location, etc., as well as incidental factors, influence the behaviour of unit cost. In this respect, the evolution of the size of the school appears to have a significant impact on unit expenditure (economies of scale) only for fixed cost items such as 'non-teaching staff' and 'administration'.

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[1] See 'Uganda: educational cost evaluation', on page 13 of this volume.

It does however appear likely that if there were greater financial control by the government, and if there were more equality in the financing of different schools, unit non-teaching costs in all but the double-shift day schools could be reduced significantly. At present there are very wide differences between similar schools in expenditure on specific heads, which can only be explained by the fact that some schools receive much more finance than others. This in itself is an important conclusion of this study.

Educational planning decisions

It goes without saying that analysis of unit cost behaviour is a basic step in the costing of educational plans, in that it helps to define norms and standards, and to establish the relationship between unit cost and some key variables.

To sum up, this study shows that cost analysis based on appropriately itemized school accounts can yield results which are sufficiently significant to be of real value in educational planning.

Appendix I

Summary of findings and recommendations
of the Working Party
for the Secondary Schools Costs Survey,
Kampala, Uganda, March 1964 (unpublished)

Chapter I

(a) The over-all costs of 4 completed years of secondary education average £640 per boarding and £292 per day student (£160 and £73 per annum respectively).

(b) The corresponding figures for HSC (2 completed years), seem to be £420 for boarding and £270 for day pupils (£210 and £135 respectively).

(c) S.1-4 *drop-outs* and class sizes are the principal factors in explaining inter-school variations in costs.

(d) For boarding schools, capital costs (buildings and equipment expressed in annual terms) are probably the largest single element in total costs—over one-third. Teacher costs account for another third.

(e) Teacher costs represent 75 per cent of the total costs of day schools.

(f) Significant economies in capital costs per student are possible in boarding schools, without loss of educational efficiency.

(g) Under the present fee/grant structure, the value of *tuition* buildings and equipment per student is twice as high in the average boarding school as in the average day school. This is also the case with respect to tuition materials (books, etc.). This has no justification either educationally or economically, and those factors (tuition materials especially) significantly affect the performance of students.

(h) We found significant inter-school differences in *per capita* (non-academic) boarding costs. We believe such differences should be reflected in differences in fees.

Chapter II

Capitation grants (*per capita*) should be:

	Tuition	Boarding	Total
Boarding schools—CSC	£12	£10/10/—[1]	£22/10/—
—HSC	£20	£10/—/—[1]	£30/—/—
Day schools —CSC	£12	—	£12/—/—
(by way of share of fee income) —HSC	£20	—	£20/—/—

[1] Subject to increase of £3/10/- if uniforms are to be provided free by school and to increase of 10/- for up-country schools for extra transport costs.

Chapters III, IV and V

(a) By increasing science HSC streams from single to double stream, *per capita* costs (including amortization) can be reduced from £130 per annum to £87—

a saving of over one-third. Capital costs per place are reduced from £382 to £186—a saving of over 50 per cent.

(b) The most economic size of school appears to be one with a double-stream HSC and a 5-stream CSC course.

(c) A teacher with 2 or 3 subject degrees is of more value in a school than one with only a special degree: the B.Ed. course at Makerere should produce such graduates capable of teaching at least 2 subjects up to HSC level.

Chapters VI and VII

(a) Teacher costs (salaries, passages, and housing) can be reduced by alteration to the academic year, and by arranging for leaves to be taken during school holidays.

(b) Accelerated 3-year CSC courses should be permitted.

(c) The elimination of wastage (i.e. pupils leaving school before completing the CSC course) will significantly reduce *per capita* costs—both recurrent and non-recurrent—and may be achieved by increasing S.1 and S.2 fees and correspondingly decreasing those for S.3 and S.4.

(d) Transport savings will be achieved by revising methods of selection for joining S.1 in secondary schools.

(e) No further HSC courses should be started until schools already offering HSC have been fully expanded to the optimum enrolment.

Chapter IX

(a) Present capital grants per new pupil are £200 (minimum) below true capital costs.

(b) Simpler standards must be adopted to reduce costs.

(c) Pre-fabricated buildings may lead to the necessary savings in costs.

Chapter X

(a) Most school buildings are presently not maintained properly with consequent detriment to their capital value, thus shortening their economic life.

(b) To remedy this position, a central maintenance fund should be set up under the control of the Ministry of education.

General

This exercise should be repeated annually in order to:

(a) provide more accurate statistics and financial results;
(b) form a guide to future planning and the efficient use of resources;
(c) provide a basis for comparisons of the efficiency of schools;
(d) check upon the performance by schools of Ministry directives;
(e) check upon the effects of Ministry directives upon schools.

Appendix II

Standard accounting format as recommended by the Committee on the Reform of Secondary School's Accounts (1965)

	I	II	III
	Living costs	Tuition costs	Medical
A. Salaries and emoluments	Boarding: 1. Responsibility allowances 2. Matron 3. Warden/Caterer 4. Cooks and helpers 5. Cleaners 6. Total	(a) C.S.C. (b) H.S.C. 1. Teachers' salaries[1] resp. allowances Ministry costs 2. Lab. assistants 3. Librarian 4. Cleaners 5. Groundsmen 6. Total	1. Nurse 2. Total
B. Stores, minor equipment and services	1. Food 2. Clothing 3. Sanitation 4. Fuel and power 5. Water 6. Minor kitchen/dining room equipment 7. Minor dormitory/common room equipment 8. Total	1. Textbooks (a) Arts (b) Science 2. Teaching materials (a) Arts (b) Science 3. Lighting/Power (a) Arts (b) Science 4. Total	1. Medicines other 2. Total
C. Transport	of: Stores, etc.	of: Pupils, staff and tuition stores	of: Pupils, staff
D. Maintenance and repairs	of: 1. Buildings 2. Equipment 3. Grounds, roads 4. Total	of: 1. Buildings 2. Equipment 3. Grounds, playing fields 4. Total	of: 1. Buildings 2. Equipment 3. Total
E. Depreciation	1. Buildings 2. Equipment 3. Total	1. Buildings 2. Equipment 3. Library (books) 4. Total	1. Buildings 2. Equipment 3. Total
F. Total recurrent expenditure			
G. Capital additions	1. Buildings 2. Equipment 3. Total	1. Buildings 2. Equipment 3. Library (books) 4. Total	1. Buildings 2. Equipment 3. Total
H. Total expenditure			
I. Replacements	1. Buildings 2. Equipment 3. Total	1. Buildings 2. Equipment 3. Library (books) 4. Total	1. Buildings 2. Equipment 3. Total

[1] To include responsibility allowances of Senior Form Masters, Acting Headmaster, etc.

IV	V	VI	VII	VIII
Administration	Sub-total	Transport	Maintenance and repairs	Total
1. Headmaster 2. Bursar 3. Secretary 4. Clerk 5. Office boy/ messenger 6. Storekeeper 7. Total		1. Driver 2. Mechanic 3. Total	1. Watchmen 2. Labour supervisor 3. Workmen — skilled, unskilled 4. Profession fees and labour charges on contract repairs 5. Total	
1. Office 2. Bank 3. Post Office 4. Audit 5. Insurance 6. Rents/Rates 7. Employees uniforms 8. Entertainment 9. Contingencies[2] 10. Total		1. Petrol/Oil 2. Hire of vehicles 3. Insurance of vehicles 4. Total	1. Materials 2. Tools 3. Material cost of contract maintenance 4. Total	
of: 1. Headmaster 2. Bursar 3. Board of governors 4. Total				
of: 1. Buildings 2. Equipment 3. Total		of: Vehicles	of: Maintenance equipment	
1. Buildings 2. Equipment 3. Total		Vehicles	1. Buildings 2. Equipment 3. Total	
1. Buildings 2. Equipment 3. Total		Vehicles	1. Buildings 2. Equipment 3. Total	
1. Buildings 2. Equipment 3. Total		Vehicles	1. Buildings 2. Equipment 3. Total	

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[2] This will appear in the estimates. In the accounts, expenditure out of this vote will, presumably, appear under the appropriate head.

Appendix III
Example of the use of standardized accounts—School J(hd)

Head and item		1965	1966	1967
1. *Non-teaching staff*				
1.1 Clerical, nursing, laboratories, etc.		33.42	31.22	30.77
1.2 Semi-skilled/unskilled labour		18.67	16.27	13.73
1.2a Domestic staff				
Total		52.09	47.49	44.50
2. *Tuition*				
2.1 Textbooks	U	78.46	47.21	92.64
	L	19.31	38.52	33.58
2.2 Teaching materials	U	14.08	19.45	21.96
	L	21.37	18.77[1]	20.82[1]
2.3 Science	U	157.58	233.92	204.53
	L	7.12	6.26	6.06
2.4 Art, handicraft, domestic science[2]	LF	27.92	30.36	27.73
2.5 Music, drama				
2.6 Technical subjects[2]	LM	—	—	21.67
2.7 Library/Reading room	U	23.37	56.12	31.16
	L	1.32	0.94	0.31
2.8 Sports and games	U and L	6.03	4.39	3.68
Total U	S	279.52	361.09	353.97
Total L	A	121.94	127.17	149.44
	M	55.15	68.88	86.12
	F	83.07	99.24	92.18
3. *Boarding*			*Not applicable*	
4. *Maintenance and Upkeep*				
4.1 Grounds		13.13	14.69	12.12
4.2 Buildings		3.61	2.43	2.86
4.3 Water		1.08	2.04	2.33
4.4 Lighting		3.00	2.89	3.44
4.5 Repairs and replacement of furniture and electrical fittings		8.53	5.65	14.22
4.6 Rates				
4.7 Cleaning materials				
Total		29.35	27.70	34.97
5. *Administration*				
5.1 Office expenses		4.03	4.46	2.91
5.2 Office equipment				
5.3 Postal and telephone expenses		4.50	3.92	1.78
5.4 Audit and accountancy fees		1.34	1.35	1.13
5.5 Entertainments		—	0.55	0.93
5.6 Students' uniforms				
5.7 Examinations				
5.8 Insurance and Provident Fund				
5.9 Sundries		1.95	3.62	2.55
Total		11.82	13.90	9.30

6. *Transport and Travelling*			
6.1 Staff	2.94	2.30	1.65
6.2 Students			
6.3 Stores			
6.4 Vehicle maintenance and operation			
6.5 Depreciation of vehicles			
Total	2.94	2.30	1.65
US	375.72	452.48	444.39
UA	218.14	218.56	239.86
LM	151.35	160.27	176.54
LF	179.27	190.63	182.60

U = Upper
L = Lower
S = Science
A = Arts
F = Female
M = Male

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1. Includes 'art materials', inseparable.
2. M 'technical', F 'domestic science'.

Appendix IV

Characteristics of sample schools

School	Code[1]	Sex of students	Residence of students	Number of stages	No. of daily sessions	Region	Comments on location
Aga Khan School, Kampala	I (h)	MF	day	2	1	Buganda (central)	In the main city.
Duhaga Secondary School	*B* (b)	MF	boarding a few day	1	1	western	On the edge of a small town some 120 miles west of the main city.
Gayaza High School	[E](bh)	F	boarding	2	1	Buganda (central)	Ten miles north of the main city.
Jinja Secondary School	K (d)	MF	day	1	2	eastern	In the second largest town of the country, 50 miles to the east of the main city, on the main railway line from the coast.
St. Mary's College, Kisubi	[G] (bh)	M	boarding a day stream beginning 1967	2	1	Buganda (central)	On the road joining the main city to the administrative capital 15 miles from the former and 6 from the latter.
Kitante Hill School	H (d)	M	day	1	2	Buganda (central)	In the main city.

Kyebambe Secondary School	*A* (b)	F	boarding a few day	1	1	western	On the edge of a medium-sized town some 210 miles west of the main city.
Mbale Secondary School	J (hd)	MF	day	2	2	eastern	In the third largest town of the country, some 130 miles north-east of the main city, close to the railway line from the coast.
Mbarara High School	F (b)	M	boarding a very few day	1	1	western	On the edge of a medium-sized town some 165 miles south-west of the main city.
Bishop's School, Mukono	C	MF	day with some boarding	1	1	Buganda (central)	On the edge of a small town 13 miles east of the main city.
Mvara Secondary School	D (b)	MF	boarding 2 day streams beginning 1967	1	1	northern	On the edge of a medium-sized town some 300 miles north-west of the main city.

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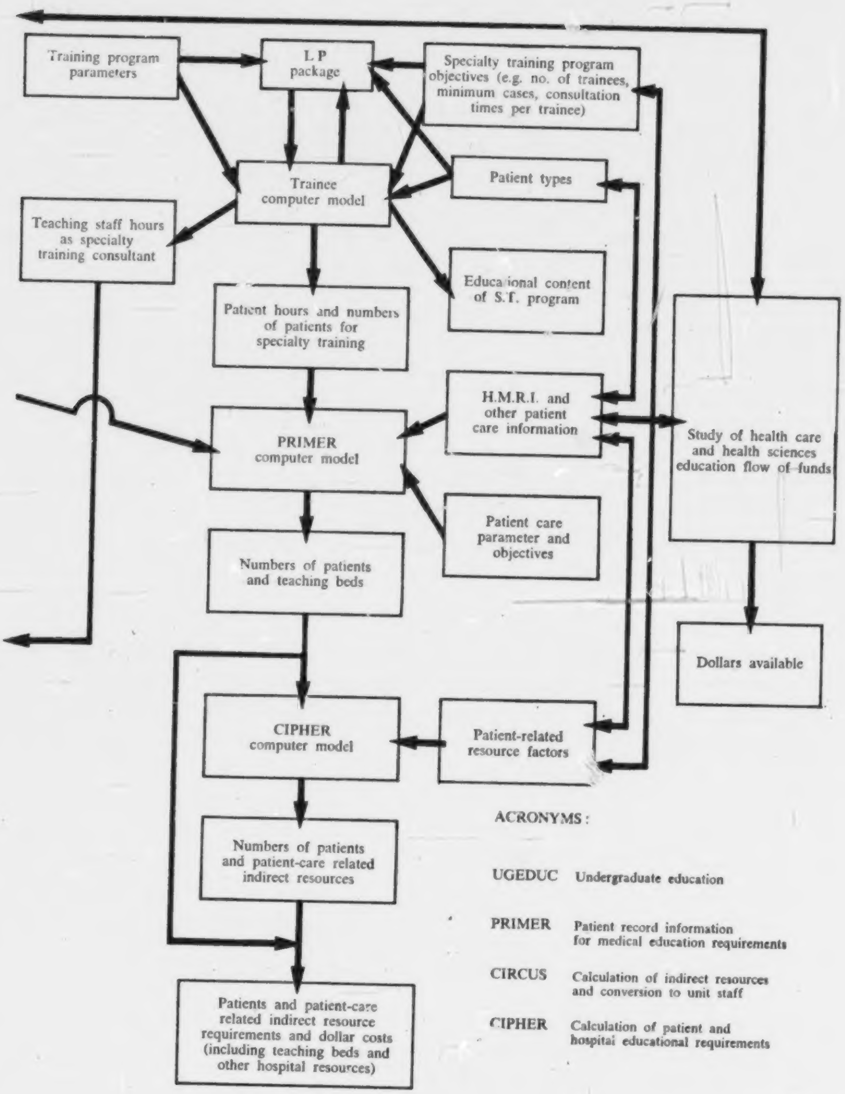
1. See page 76.

Appendix V Basic statistics of sample schools, 1965 to 1967

		Number of classes at each grade											Enrolments		
School	Year	8 S. 1	9 S. 2	10 S. 3	11 S. 4	Total	Special-ization	12 S. 5	13 S. 6	12-13 S. 5-6	Total	Residence	8-11 S. 1-4	12-13 S. 5-6	Total
A (b)	1965	2	—	—	—	2		—	—	—	2	boarding	49	—	49
												day	8	—	8
												total	57	—	57
	1966	2	2	—	—	4		—	—	—	4	boarding	108	—	108
												day	15	—	15
												total	123	—	123
	1967	3	2	2	—	7		—	—	—	7	boarding	145	—	145
												day	34	—	34
												total	179	—	179
B (b)	1965	2	—	—	—	2		—	—	—	2	boarding	58	—	58
												day	4	—	4
												total	62	—	62
	1966	2	2	—	—	4		—	—	—	4	boarding	121	—	121
												day	6	—	6
												total	127	—	127
	1967	2	2	2	—	6		—	—	—	6	boarding	154	—	154
												day	39	—	39
												total	193	—	193
C	1965	1	1	2	2	6		—	—	—	6	boarding	37	—	37
												day	144	—	144
												total	181	—	181
	1966	2	1	1	2	6		—	—	—	6	boarding	45	—	45
												day	152	—	152
												total	197	—	197
	1967	2	2	1	1	6		—	—	—	6	boarding	51	—	51
												day	154	—	154
												total	205	—	205


Training program parameters
L P package
Specialty training program objectives (e.g. no. of trainees, minimum cases, consultation times per trainee)
Trainee computer model
Patient types
Teaching staff hours as specialty training consultant
Educational content of S.T. program
Patient hours and numbers of patients for specialty training
H.M.R.I. and other patient care information
Study of health care and health sciences education flow of funds
PRIMER computer model
Patient care parameter and objectives
Numbers of patients and teaching beds
Dollars available
CIPHER computer model
Patient-related resource factors
Numbers of patients and patient-care related indirect resources
Patients and patient-care related indirect resource requirements and dollar costs (including teaching beds and other hospital resources)

ACRONYMS:

UGEDUC	Undergraduate education
PRIMER	Patient record information for medical education requirements
CIRCUS	Calculation of indirect resources and conversion to unit staff
CIPHER	Calculation of patient and hospital educational requirements

3

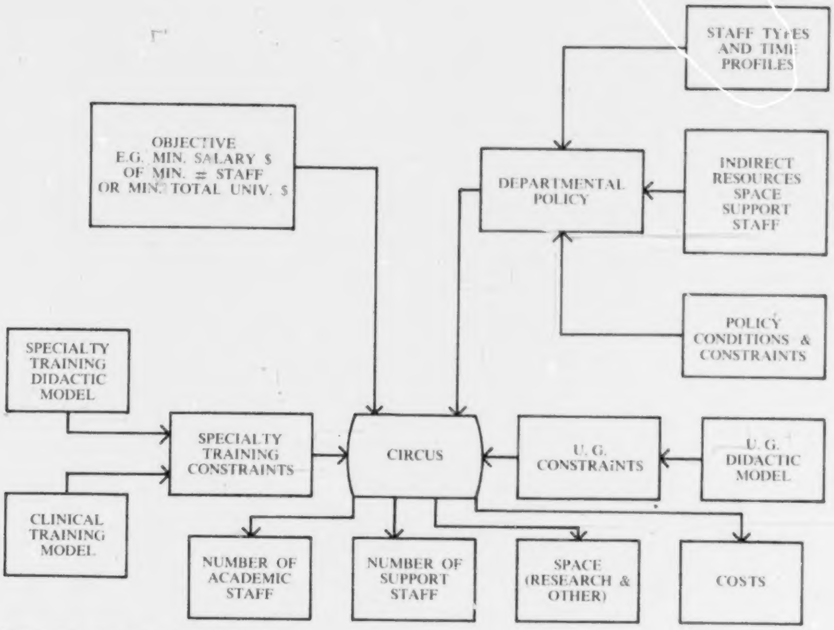

STAFF TYPES AND TIME PROFILES
OBJECTIVE E.G. MIN. SALARY $ OF MIN. # STAFF OR MIN. TOTAL UNIV. $
DEPARTMENTAL POLICY
INDIRECT RESOURCES SPACE SUPPORT STAFF
POLICY CONDITIONS & CONSTRAINTS
SPECIALTY TRAINING DIDACTIC MODEL
SPECIALTY TRAINING CONSTRAINTS
CIRCUS
U. G. CONSTRAINTS
U. G. DIDACTIC MODEL
CLINICAL TRAINING MODEL
NUMBER OF ACADEMIC STAFF
NUMBER OF SUPPORT STAFF
SPACE (RESEARCH & OTHER)
COSTS

Figure 6. *Concepts in CIRCUS.*

(vi) CHIEFF—calculation of health insurance and education flow of funds

This model computes the money available under prevailing or proposed financial policies to meet the total health sciences education system and related patient-care costs at any health science centre.

III. The use of CAMPUS simulation models by health sciences planners and decision-makers

Planning groups in the faculty of medicine are able to assess in detail the resource implications of changes in enrolment and programmes; detailed information regarding requirements for staff, space, patients and other resources are provided by the models. Answers can be rapidly obtained to such questions as: How many residents of all types can be trained within a specific programme, utilizing the available mix of beds? What levels of undergraduate and graduate training programmes can a given or proposed group of faculty members support? What changes in departmental staffing are implied by expanded undergraduate or graduate programmes within a given budget and income constraints? Is the total departmental income, expected from a given complex of institutions involved in educational programmes, compatible with the expected total salary and operating costs? Deans and institutional administrators are able to examine in detail the resource implications of alternative policies, plans and programmes within each of the departments or divisions. Departmental projections can be co-ordinated into effective and meaningful presentations for use within the university and outside it. Each component part of departmental resource projection can be objectively justified on the basis of the goals, policies and principles of operation. Senior administrative groups are able to assess the resource and budget implications of alternative constraints or policies whether imposed by the faculty, university or government. In short, the series of health science models are important instruments in achieving efficient resource allocation in this important and complex educational area.

A. Use of the model - the undergraduate education programme

The great value of computerized input-output models for health sciences planners lies in the ease with which they permit comparative evaluations of alternative plans and programmes. This produces an interactive sequence which, it is hoped, will lead to better decision-making.

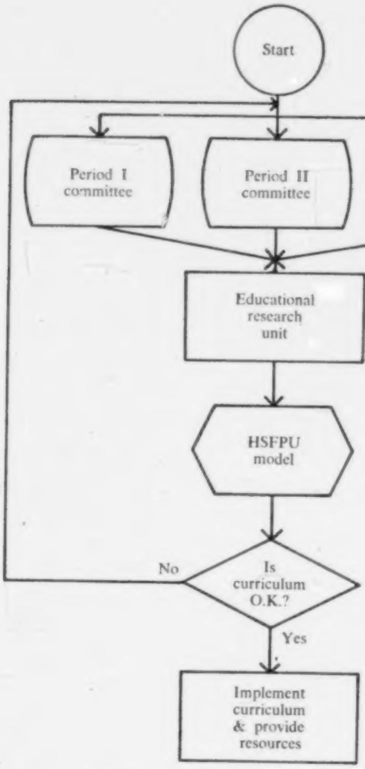
The Health Sciences Functional Planning Unit is working closely with the curriculum period committees to assess resource requirements under various proposals being considered for the new curriculum expansion of enrolment and hospital involvement in this expansion. Figure 7 displays the flow of information among these groups. Proposed syllabi are generated in the systems and topics committees, and are reconciled and co-ordinated for each period by the period committees. The proposed period curricula are: (a) tested for timetable feasibility; and (b) submitted to the Health Sciences Functional Planning Unit for an estimate of their resource input requirements.

Reports on resource requirements go back to the period committee and to the curriculum committee for further consideration. This interaction between the curriculum planners and the analysts has been going on since late in 1967 and has now become both efficient and effective. Over 100 major alternatives were analysed.

We shall now proceed to show, using simple analyses, how the UGEDUC model is being used to evaluate the impact of proposed changes. The illustration corresponds to the major problems enumerated above. Examining, first, the effect of expanded enrolment only, we add successive levels of complication by introducing variations in curriculum, class size, number of teaching hospitals, etc. The combined effect of all these factors operating simultaneously is of prime interest to the decision-makers, but cannot easily be shown in a few pages.

(a) Scale effects

Table 2 illustrates the effect of scale expansion only, with enrolment increased from 175 to 250 students per class. The impact is shown for two clinical departments (Medicine and Surgery), all clinical departments, all basic science



1. The three systems committees generate a curriculum.
2. Curriculum is specified in detail and checked for timetable feasibility.
3. Curriculum is simulated and estimates produced of staff, space, beds, equipment, etc. needed to support it. These estimates retained in case curriculum is approved.
4. Pedagogic benefits and resource requirements are evaluated by Curriculum Committee, Departmental-Chairman and Faculty Council.

FIGURE 7. *University of Toronto Faculty of Medicine: flow of information in curriculum planning.*

departments, and for the entire faculty. The implications are shown for two resources, viz., (a) academic staff contact hours per year, and (b) hospitalized patient contact hours per year.

With a 43 per cent increase in enrolment, the total academic staff contact hours would increase by 40 per cent, and the required hospitalized patient contact hours would rise by 43 per cent. In the clinical departments, where small group teaching prevails, the requirements for both resources increase in almost direct proportion to the increase in the number of students. But in the basic science departments, the requirement for academic staff contact hours would increase by only 20 per cent. This reflects the fact that many classes in these departments are of the lecture type, where the group size can be increased.

Because the great bulk of academic contact hours devoted to undergraduate medical instruction is provided by the clinical departments, where requirements increase in direct proportion to the number of students, the economies of scale in these two resources are not appreciable.

TABLE 2. Effect on two resources of scale expansion from 175 to 250 students per class.[1] All other factors unchanged.[2]

	Academic staff contact hours per year		Hospitalized patient contact hours per year	
	175 students per class	250 students per class	175 students per class	250 students per class
1. Department of Medicine	10 785	15 772	40 306	57 642
2. Department of Surgery	7 622	10 294	29 257	41 499
3. All Clinical Departments	39 075	56 558	102 052	145 964
4. All Basic Science Departments	10 168	12 276	—	—
5. Total for entire Faculty of Medicine	49 243	68 834	102 052	145 964

1. Assuming 225 students in first year, 250 students in the last three years.
2. The curriculum is as in 1967/68. The distribution of students among eleven teaching hospitals is as in 1966/67.

TABLE 3. Health sciences functional planning unit—print-out 1

Breakdown report table
for lecture rooms
Report by simulation
periods

1972–73 weeks 1–35

Output in hours per
simulation period

Run No. 55 All periods week-
by-week new curriculum
Grp. Rl. 2 250 students

Faculty of Medicine
Institution Bant. Inst.
Dep. of Unspec. Dep.

	(1-10)	(11-20)	(21-40)	(41-85)	(86-140)	(140-)
1	230	4	0	0	0	10
2	230	4	0	0	0	10
3	230	4	0	0	0	10
4	230	4	0	0	0	10
5	60	96	0	0	0	15
6	0	27	0	0	0	43
7	0	27	0	0	0	43
8	0	27	0	0	0	43
9	111	0	55	0	0	2
10	128	31	62	0	0	0
11	263	67	0	0	0	0
12	263	67	0	0	0	0
13	263	67	0	0	0	0
14	0	8	0	0	0	10
15	0	8	0	0	0	10

(b) Effects of curriculum change

The proposed change from a 'departmental' to a 'systems' curriculum was generally described in Part II B. During the second half of 1967, a detailed new curriculum was drawn up by the various period committees. The result of this work was submitted to the Health Sciences Functional Planning Unit for an assessment of its resource implications.

Detailed computations of requirements were made by means of the models for all departments and all teaching hospitals. Table 3 is an example of the kind of detailed computer report that was produced. It shows weekly hours required for lecture rooms of various size in the Banting Institute during the first fifteen weeks of the academic year 1972/73. Table 4 provides summary information on patient requirements.

TABLE 4. Health sciences functional planning unit—print-out 2

Report table for patient requirements Totals for simulation periods	1972/73 weeks 1–35		Output in hours per simulation period Run No 58 Proposed U of T Curr. Act. 1 Curr. 3 250 students
Faculty of Medicine Totals per department over 11 institutions			
	Amb. pat.	Hosp. pat.	Special pat.
Immunology	0.00	1 242.00	0.00
Medicine	18 199.10	52 691.70	0.00
Obst.-Gyn.	8 399.80	18 517.70	0.00
Ophthal.	6 237.00	4 323.00	0.00
Oto-Laryn.	6 220.50	7 917.30	0.00
Paediatrics	8 600.80	22 693.20	0.00
Psychiatry	8 504.90	9 336.80	0.00
Surgery	23 052.20	39 221.10	0.00
Unspecified clinical department	1 209.70	2 009.80	0.00

Table 5 shows the impact of changing curriculum on academic staff and hospitalized patients. With 250 students per class, the proposed systems curriculum would require about 85 per cent more academic staff contact hours for the entire faculty. In the clinical departments, the requirement for academic staff contact hours would be about twice as large with the proposed systems curriculum as with the departmental curriculum, while requirements for hospitalized patients would be some 10 per cent more under the systems curriculum.

To assess the impact of curriculum upon the departments, it is necessary to study the time-phasing of the load. Figure 8 shows computer-prepared Calcomp plots of the weekly requirements for academic staff and all staff contact

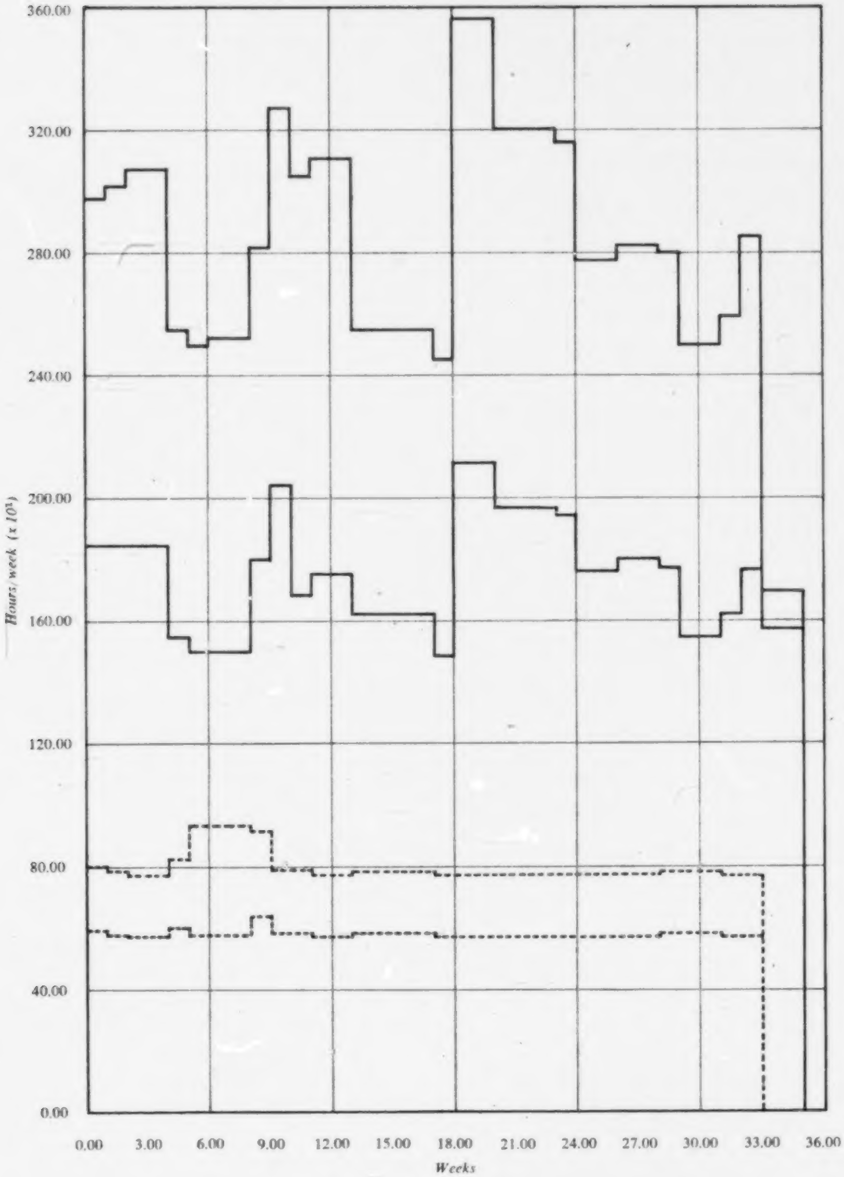


FIGURE 8. *Health Sciences Functional Planning Unit: week-by-week contact hours for academic staff and all staff, departments of medecine (solid lines) and anaesthesia (broken lines) in all institutions.*

hours that would be needed by the new systems curriculum with 250 students. The load of the Department of Medicine shows strong peaking, whereas that of the Department of Anaesthesia is much more evenly distributed.

TABLE 5. Effect on two resources of curriculum change with 250 students per class[1]

	Academic staff contact hours per year (250 students per class)		Hospitalized patient contact hours per year (250 students per class)	
	Departmental curriculum	Systems curriculum	Departmental curriculum	Systems curriculum
1. Department of Medicine	15 080	31 903	57 400	52 691
2. Department of Surgery	10 328	30 185	41 384	39 221
3. All Clinical Departments	53 952	111 011	145 376	157 953
4. All Basic Science Departments	12 744	13 114	—	—
5. Total for entire Faculty of Medicine	66 696	124 125	145 376	157 953

1. Assuming 225 students in first year, 250 students per class. Students were distributed among hospitals as follows:
Period I : 100 per cent in medical science and anatomy buildings
Period II and III: 23 per cent at Toronto General Hospital
23 per cent at Sunnybrook Hospital
15 per cent at Toronto Western Hospital
15 per cent at St. Michael's Hospital
Remainder divided equally among New Mt. Sinai, Wellesley, and Women's College hospitals.

(c) Combined effects of scale increase and curriculum change

Table 6 is a summary of the combined effects of (a) a scale increase from 175 to 250 students per class, and (b) changing from the present departmental curriculum to the proposed systems curriculum. In addition, it reflects a redistribution of students among teaching hospitals.

The proposed programme (250 students, systems curriculum) would require about 150 per cent more academic staff contact hours than the present situation

TABLE 6. Combined effect on two resources of scale expansion and curriculum change.[1] (Ratio of proposed to existing situation)

	Academic staff contact hours per year (Col. 2, Table 5 over Col. 1, Table 2)	Hospitalized patient contact hours per year (Col. 4, Table 5 over Col. 3, Table 2)
1. Department of Medicine	2.96	1.31
2. Department of Surgery	3.96	1.34
3. All Clinical Departments	2.84	1.55
4. All Basic Science Departments	1.29	—
5. Total for entire Faculty of Medicine	2.52	1.55

1. The figures show the ratios of the proposed programme (250 students per class, systems curriculum) over the existing situation (175 students per class, departmental curriculum).

(175 students, departmental curriculum). The increase would be considerably greater in the clinical departments. For contact hours with hospitalized patients, the proposed programme would involve an increase of about 50 per cent.

(d) Effects of alternative numbers of teaching hospitals

Medical educational planners at the University of Toronto wanted to assess the implications of alternative patterns of participation by the various teaching hospitals. If there are significant economies of scale, costs might be reduced by concentrating clinical teaching in a few hospitals.

Analyses of various alternative configurations are being made. The requirements for academic staff, offices, patients, beds, research facilities and other resources are computed for each department in each teaching hospital. This information is presented to the decision-makers, who evaluate the costs and benefits of the alternatives.

Table 7 displays the impact on required teaching beds of alternative distributions of medical students among the teaching hospitals. The results of four hypothetical sets of student distributions are compared with the number of teaching beds available on 31 December 1967. The aggregate number of beds presently available would be sufficient to accommodate any distribution of students. Bottlenecks appear as requirements are disaggregated to the levels of hospitals and departments therein.

TABLE 7. Impact on teaching bed requirements of alternative distributions of medical students among teaching hospitals

Hospital	Case 1		Case 2		Case 3		Case 4		Available teaching beds, Dec. 1967
	Students per class	Beds	Students per class	Beds	Students per class	Beds	Students per class	Beds	
A	58	404	125	879	94	660	150	1 040	824
B	39	281	—	—	62	561	100	677	622
C	39	249	—	—	—	—	—	—	818
D	19	107	—	—	—	—	—	—	343
E	19	107	—	—	—	—	—	—	343
F[1]	*75*	156	*50*	101	*65*	132	*100*	204	350
G	58	464	125	1 011	94	775	—	—	770
H	19	112	—	—	—	—	—	—	278
Totals	251	1 880	250	1 991	250	2 128	250	1 921	4 600

[1] Figures in *italic* represent percentage of paediatric instruction.

(e) Effect of staffing policy on the requirements for staff

Once the total teaching load in terms of contact hours is known, there are many alternative staffing policies that could be used to make this time available. A

TABLE 8. Comparisons of full-time (FTE) academic staff requirements for selected clinical departments[1]

	FTE Academic staff	FTE academic staff from 1972/73 simulated contact hours		
Department	1970/71 Budget forecast	Policy A	Policy B	Policy C[2]
Medicine	237.5	151.9	189.1	314.2
Surgery	167.0	138.1	195.5	207.1
Psychiatry	85.0	60.2	65.1	190.1
Obs. and Gyn.	40.0	24.6	27.1	30.1

1. New curriculum, seven teaching hospitals, 250 students per class
2. The average weekly number of contact hours with medical undergraduates in 1966/67 per FTE academic staff member was: for Medicine—2.9 hrs., Surgery—4.0 hrs., Psychiatry—1.9 hrs., and Obs. and Gyn.—4.9 hrs.

significant factor in this decision is the amount of time to be devoted to research Table 8 illustrates the effects of the three following staffing policies:

Policy A	On an average, six hours of teaching activity required per week per staff member.
Policy B	Staff members required to teach no more than two hours per week of lectures or seminars, and no more than four hours per week of clinics, small group and individual instruction.
Policy C	Each department requires the same average number of teaching hours from its staff members as that provided in 1966/67. These figures were obtained from an analysis of staff activities in the past year.

Table 8 indicates that retention of the present staffing profile (Policy C) would, by 1972/73, necessitate significant increases above the levels forecast by departmental chairmen in their 1970/71 budget proposals. The Department of Obstetrics and Gynaecology is an exception; here the needs appear to decline by about one quarter.

Staffing policy embraces a crucial set of variables. Sensitivity analysis carried out with the UGEDUC model indicates that the staff activity profile carries profound implications for staff and indirect resource requirements. We are now conducting experiments to elucidate the impact of alternative policies concerning: (a) direct contact hours in undergraduate clinical teaching and specialist training per staff member; (b) extent and type of research activity; (c) extent and type of clinical practice. Great variation is expected in system requirements as a result of alternative sets of values given to these factors.

(f) Other sensitivity analysis—increasing class size on the average 20–25 per cent for all activities

There are many decision variables of less apparent importance than the size of student body, curriculum content, number of teaching hospitals, and staffing policy. These variables can still have significant effects on both the size and composition of resource requirements. The simulation model provides a means of assessing the sensitivity of particular analyses to changes in these secondary variables.

As an example of this type of analysis, Table 9 shows the impact on academic staff contact hours of increasing the average class size by 20-25 per cent. The seven hospital, systems curriculum, 250 student, Period II case is used as the basis for comparison.

TABLE 9. Effect of increasing group sizes. Impact on academic staff contact hours with Period II students over academic year

	Period II academic staff contact hours with		
	Group sizes as proposed in new curriculum	Group sizes 20-25 % larger than in new curriculum[1]	% Decrease in Period II contact hours with larger groups
	Academic staff	Faculty staff	Faculty staff
Medecine (incl. Fam. Med)	10 707	8 929	18.0
Ophthalmology	53	35	51.4
Surgery	5 000	4 531	9.4
All clinical depts.	25 139	21 611	14.0
All Basic Science depts.	3 502	3 135	10.5
Total for faculty	28 641	24 746	13.6

1. The change increased small group sizes to the next integer value, e.g., groups of four went to five and groups of five went to six.

Judgment about the effect of such changes on pedagogical effectiveness is left to department heads, curriculum planners and other medical experts.

B. Use of the model - the clinical training programme

Graduate medical education (speciality training) includes many academic, service and research components. The two containing the majority of the educational activities are (a) the programme of formal instruction arranged by the faculty; and (b) the clinical experience which a student receives from participating in the delivery of health care to 'hospitalized' and 'ambulatory' patients.

Two mathematical simulation models have been developed to study these areas. One model, incorporating all aspects of formal instruction (Model UGEDUC), has been described above as applied to the undergraduate programme. This section describes the development and application of a second mathematical simulation model for the study of clinical training (Model TRAINEE).

1. *Objectives of the clinical training model*

The objective of the research project was to structure graduate medical education in terms of a 'dynamic' system suitable for computer programming. A mathematical model which meets this objective has been created. It accepts detailed descriptions of any system of graduate medical education, and analyses their pedagogic quality and impact upon any number of educational or health care resources.

The simulation model can be used by educational planners to obtain information regarding:

(a) the numbers of students of various types and levels who could be trained within alternative programmes, utilizing presently available or projected clinical material and/or consulting staff at each training hospital;

(b) the clinical material, consulting staff and associate resources necessary at one or more teaching hospitals to train a specified complement of students under any clinical training programme;

(c) the detailed educational experiences encountered by students of each level under alternative training programmes (an index of the quality of the programme);

(d) quantitative objective information relating to questions regarding the educational structures and resource implications of alternative methods of speciality training within any speciality or sub-speciality.

2. *The design of the simulation model*

The simulation model has been designed to accept two basic philosophies regarding the clinical experience involved in graduate medical education: (a) graded responsibility; (b) apprenticeship.

(a) *Graded responsibility*

In this system of clinical training, the 'responsibility' for a specified portion of a patient's care rests with the most junior member of a health care team designated by policy as qualified to undertake it. Consultation (supervision) is required and carried out with progressively more senior members of the team, as decisions are made relating to the many aspects of patient care. This system of training is one of student-teacher-patient interaction throughout a team, as health care is delivered. The system of 'graded responsibility' exists in total or part at most hospitals presently involved in graduate medical education.

(b) *Apprenticeship*

In this system of training, two individuals—one a faculty member, the other a student—work together throughout all stages of a patient's illness and care. The level of qualification of the apprentice is dependent upon 'chance' rather than programme objectives. This type of clinical training is most frequently encountered in the interaction of 'staffman' and 'fellow' or 'assistant resident' with 'private' patients.

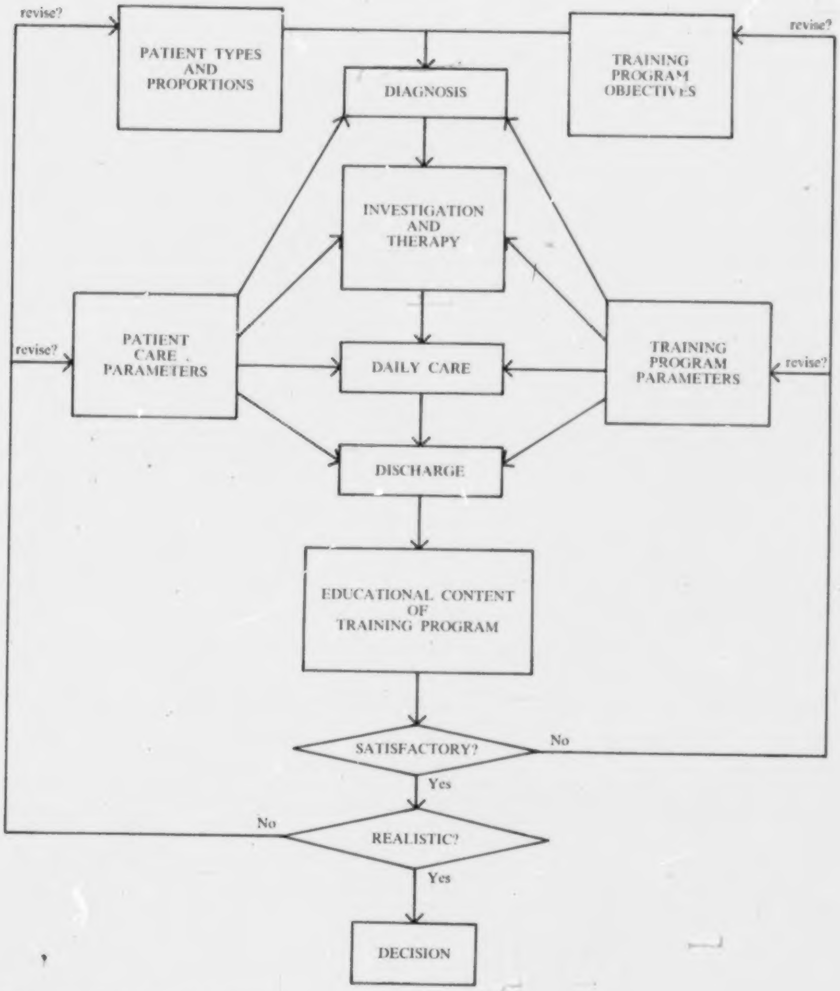

revise?
PATIENT TYPES AND PROPORTIONS
DIAGNOSIS
TRAINING PROGRAM OBJECTIVES
revise?
INVESTIGATION AND THERAPY
revise?
PATIENT CARE PARAMETERS
DAILY CARE
TRAINING PROGRAM PARAMETERS
revise?
DISCHARGE
EDUCATIONAL CONTENT OF TRAINING PROGRAM
SATISFACTORY?
No
Yes
No
REALISTIC?
Yes
DECISION

FIGURE 9. *Clinical training model.*

3. *Sample analysis of a clinical training programme*

As shown in Figure 9, information is fed into the simulation model on the training programme objectives (the number and type of specialists to be trained), the training programme parameters (details of the educational programme, including the required exposure to various types of patients) and patient care parameters (the actions necessary to render care to various types of patients at various stages of their hospitalization, including diagnosis, therapy, daily care and discharge). The model then computes the minimum number and type of patients required to meet all of the stated patient care and training programme objectives. Table 10 is a summary of the result of an analysis for the Department of Gynaecology under a particular set of conditions. The minimum number of patients required per month to meet all of these conditions is 230, broken down according to the patient type distribution shown. Considering the utilization of beds that can be expected, the average length of stay of patients in this department, and the probability of getting the kinds of patients required, 230 patients

TABLE 10. Clinical training model (ouput). Patient requirement analysis

Department: Gynaecology
Analysis No.: G1
Conditions and results of runs in this analysis

1. Patient type distribution (% minor/% major)	
Diagnosis	85/15
Therapy	80/20
Daily care	88/12
Discharge	72/28
2. Minimum number of patients per month	230
3. Required teaching beds	79
Patient-to-beds conversion factor	.34

TABLE 11. Clinical training model (output). Patient requirement analysis

Department: Gynaecology
Analysis No.: G1
Critical training objectives from this analysis

Type of trainee	Patient type	Minimum number of cases per month per trainee				
		Diagnosis		Therapy		Discharge
		Initial	Total	Initial	Total	Initial
Clinical Clerk	Minor	—	—	—	—	—
	Major	—	—	—	—	—
Intern	Minor	—	40	5	—	*5*
	Major	—	2	—	—	—
Asst. resident	Minor	—	40	40	—	*40*
	Major	—	5	4	—	4
Resident	Minor	—	20	10	—	*10*
	Major	—	25	20	—	20

per month implies a need for 79 teaching beds. Table 11 contains a description of the minimum number of cases per months that each of the various types of trainees was to be exposed to under this particular set of conditions. The figures shown in italics are those that turned out to be critical in terms of this analysis. In other words, had the requirements for the minimum number of discharge patients of a minor type that were to be exposed to the various types of trainees been fewer than the number indicated in this table, then fewer patients would have been required. On the other hand, a reduction in the minimum number of major diagnostic patients required would not mean that fewer patients would be required over-all. The further analysis G-2 has been carried out to assess the impact of removing completely the minimum exposure requirements for discharge patients. In Table 12, the results of this analysis showed that 31 fewer patients per month would be required by the Department of Gynaecology and 11 fewer teaching beds.

The evaluation as to whether or not it is worth saving 11 teaching beds in this way is to be made by the educators themselves. This type of analysis can enable them to assess the impact of altering their educational programmes and performing cost-benefit analysis, they themselves providing the assessment of benefits, and the model providing the cost implications of alternatives.

TABLE 12. Clinical training model (output). Patient requirement analysis

Department: Gynaecology
Analysis No.: G2
Conditions and results of runs in this analysis

1. Patient type distribution (% minor/% major)	
Diagnosis	85/15
Therapy	80/12
Daily care	82/12
Discharge	72/28
2. Minimum number of patients per month	199 (230)
3. Required teaching beds	68 (79)
Patient-to-beds conversion fa[illegible]	*.34*

4. *Analysis of space requirements*

Information from UGEDUC and TRAINEE is combined to produce total resource requirements. One of the most important resources that is analysed in this way is space.

Table 13 is an example of a university-wide report on space, comparing forecast of lecture room requirements at each size interval with space available. This report has three sections. At the top of the page, the total number of rooms available is matched against the total number of rooms required, and the differential is calculated. In this part of the report, we assume no allocation of deficiencies of smaller lecture rooms into larger ones. The centre section shows the requirements

TABLE 13. University of Toronto. CAMPUS simulation planning exercise

University-wide matching report for lecture room facilities. Year 1966/67. Lecture, seminar and tutorial rooms.

Size (students)	Total rooms available	Forecast total rooms required	Differential
0– 20	53.0	72.3	−19.3
20– 60	78.0	62.2	15.8
60–100	46.0	17.5	20.5
100–180	30.0	10.0	20.0
180–999	20.0	3.4	16.6

NOTES Number of rooms calculated using a teaching week of 35.0 hours.
Room utilization parameter set at 70.0 per cent. Seat utilization parameter set at 100.0 per cent.

Since seminars, tutorials and lectures may be held in a larger room (with a corresponding drop in seat utilization), the actual overages or underages by size range are as follows:

Size (students)	Actual overages or underages
0– 20	0.0
20– 60	0.0
60–100	25.0
100–180	20.0
180–999	16.6

Total room-hours

Size (students)	Required	Available	Differential	Utilization	Deviation from expected utilization[1]	Expected overage or underage
0– 20	2 213.2	1 855.0	−358.2	119.3	49.3	−1 306.7
20– 60	1 524.2	2 730.0	1 205.8	55.8	−14.2	552.5
60–100	429.2	1 610.0	1 180.8	26.7	−43.3	945.8
100–180	245.9	1 050.0	804.1	23.4	−46.6	698.8
180–999	82.9	700.0	617.1	11.8	−58.2	581.6

[1] Expected utilization of 70.0 per cent is based on the scheduling sophistication of the University.

Table 14. University of Toronto. CAMPUS simulation planning analysis

University-wide matching report for lecture room facilities
Summary of actual excess or shortage of rooms for 10 simulation years

Size (students)	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
0– 20	0.0	0.0	0.0	−2.8	−25.7	−56.1	−88.0	110.5	140.0	178.6
20– 60	0.0	0.0	0.0	0.0	0.0	0.0	−7.7	−36.8	−74.7	−121.6
60–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−3.1
100–180	18.0	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
180–199	16.1	15.9	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Changing pattern of room shortages indicates when rooms should be built, and the number and sizes of rooms.

Estimated construction cost for lecture room facilities
Construction cost index = $20.00/sq. ft.

Size (students)	Room requirements	Square footage	Cost ($)
0– 20	−178.6	−43 839.0	916 779.41
20– 60	−121.4	−69 314.7	1 386 293.86
60–100	−3.1	−3 149.2	62 983.28
100–180	0.0	0.0	0.00
180–999	0.0	0.0	0.00
			2 366 056.50

for space with this allocation having been made. The bottom section compares forecast space requirements calculated as room-hours *versus* room-hours available, by size interval. Utilization of room-hours is calculated and compared to the utilization which can be obtained with the present scheduling system of the university. Table 14 is an example of a report that gives a summary of the university room requirements over several years and an approximate estimate of the cost of making good shortages of facilities.

C. Summary of the health sciences application of CAMPUS

Adapting CAMPUS to the planning problems of the health sciences faculties has resulted in the development of a set of generalized models that can be used for planning new or expanded educational programmes in an extremely complex area. The cost savings brought about by means of this analysis have been significant and represent more than 100 times the investment. The implications of this type of analysis for developing countries are obvious. The models help to organize the planning process and to ensure that the most efficient utilization of funds is being made. In the latter sections of this study we shall discuss some of the considerations relating to implementation and give approximate cost estimates for using the CAMPUS techniques both in health sciences and in general educational planning.

IV. The research programme on systems analysis for efficient resource allocation in higher education supported by the Ford Foundation

In April 1968, the Ford Foundation granted $750,000 to the University of Toronto for a three-year programme of academic research on systems analysis designed to to improve resource allocation in higher education.

Studies under this grant fall into the following broad categories:

1. *Educational planning for society.* This study concerns the strategic problem of determining which kinds of education should be provided to which members of the population.
2. *The design of higher educational systems.* This is concerned with those areas of university activities which are categorized by economies of scale, indivisibilities and external economies and diseconomies.
3. *Increased efficiency of university operations.* Topics here pertain to various problems and opportunities of increasing the efficiency of university planning and operations.

Central to the research is the continuation of the development of CAMPUS-type simulation models. The press release from the Ford Foundation dated 15 April 1968, referring to the previous CAMPUS developments and applications, stated *inter alia:* 'With the Foundation's grant, Toronto will extend the scope of its work beyond its own campus to encompass problems of concern to all higher education. Examples are: a system for generating comparative statistics on educational efficiency among institutions; the development of information and control networks for administering complex institutions; and the study of data bank requirements for institutions of varying size, purpose, and complexity. Richard Judy, Professor of Economics and Computer Science, will guide the work.' The research programme as constituted is an activity of the Institute for the Quantitative Analysis of Social and Economic Policy of the University of Toronto. Its main objectives as related to CAMPUS are: to develop a flexible and modular system for generating CAMPUS-type models suitable for a broad class of educational institutions; to develop a complete CAMPUS-type model for a representative (but hypothetical) university to be useable as an experimental vehicle in research; to modify this basic CAMPUS model for use as a university management game; and to develop highly responsive computer routines to facilitate interactive experimentation with CAMPUS-type models.

CAMPUS-type simulation models require data on a variety of topics. For these reasons, a project whose explicit objective is the formulation of integrated university information systems was instituted. The objectives of the project are as follows: to determine the information needs of university decision-makers; to design integrated information systems to supply economically the proper quality and quantity of information to university decision-makers and administrators; and to plan the rational use of computers and other information-processing technology to meet university information needs.

V. Other implementations of the techniques

At present, a number of universities, colleges and health sciences education centres are beginning to organize in order to adapt and implement CAMPUS for their own use. In addition, CAMPUS is being modified and applied to the planning problems of community colleges and primary and secondary school boards in Ontario.

(a) Planning for individual community colleges and the system as a whole

The Ontario Department of Education is sponsoring a project in which a CAMPUS model will be built for three of the twenty colleges of applied arts and technology.

The colleges began operating only two years ago, and this affords an opportunity to use CAMPUS in a situation of rapid growth involving many educational innovations but with most major decisions on capital investment still to be made. In addition, we shall be developing an experimental CAMPUS model of the system of colleges that can be used to make system level decisions—size and location of campuses, programmes to be offered at each institution, etc.

(b) Planning for primary and secondary education at the school board level

The Ontario Institute for Studies in Education is sponsoring a study by SRG to adapt CAMPUS to the requirements of school boards and their planning problems. Two boards are involved in this initial effort.

VI. The implementation of CAMPUS

CAMPUS is a manifestation of the approach by systems analysis to the problems of managing and planning a post-secondary educational institution. If such techniques are to contribute to the quality and efficiency of university management and planning, they must be an integral part of the management process of the institution. CAMPUS is not something that is imposed upon the institution; it is a means of articulating the plans and ideas of the decision-makers—high and low, administrative and academic—in a cohesive and structured system. The successful integration of CAMPUS depends on the way in which a number of technological and sociological factors are handled. The emphasis here is on the latter, because our own experience has shown that the political and personality problems that have to be faced during the implementation stage can combine to form an imposing barrier. The newer the institution the fewer the problems; but they do exist even in an initial planning group for a completely new institution. In older, well-established institutions, the political forces at work can take years to be fully understood. The more one attempts to deal with short-term problems, particularly next year's budget, the more likely one is to encounter resistance and political commitments that cannot be changed. As the planning horizon moves further into the future, people become more objective and more inclined toward rational analysis.

During the past four years, we have tried in vain to search for general rules that would help us to deal with the political and personality problems that arise during implementation. The only generalization we can make is that systems analyses in general do not pay enough attention to the cast of characters involved in each implementation situation. A number of steps that can be taken at least to minimize the potential problems are discussed below.

1. *Acceptance by top administrators*

Even though the techniques that have been implemented are far from perfect, the real stumbling block has to do with people, with obtaining their co-operation, confidence and involvement. Our experience suggests that without the active and enthusiastic support of the senior academic and administrative officials within the institution, a systems analysis study would be forever buried in the lower echelons of the university. Receptivity is needed on the part of the top echelons, for an administrator or academic planner who is reluctant to express his planning ideas or to explore alternatives together with the analytical group is unlikely to be able to take advantage of the techniques. Receptivity is thus not just a question of attitude towards using new methods; there must also be the desire to explore the implications of alternatives.

2. *Organizational placement*

CAMPUS is not primarily intended for the solution of particular problems that arise from time to time. It is intended mainly as an integral part of the annual budgeting and long-range planning process of the institution. Thus, while it may be advisable to use staff resources from outside the institution for certain technical development procedures and initial implementation programmes, it is essential that an internal staff group be responsible for problem formulation and the use of CAMPUS. The technical operation of the system may be carried out either internally or externally, depending on circumstances. But the internal staff group that is concerned with problem formulation and analysis must be placed within the organization in such a way as to have access to the seats of power, and be in a position to influence the major decisions of the institution.

In Figure 10, two such groups in the University of Toronto are shown in their organizational framework. The Office of Institutional Research (OIR), which acts as the implementer of CAMPUS for the university as a whole, has a Director who is also Special Assistant to the President. He sits in on all major committees and has a voice in the decision-making structure of the university.

The health sciences faculties in the University of Toronto are directed by a Vice-president and are to some extent a state within a state. For this reason, and because of the major expansion of health sciences education, a separate staff group, the Health Sciences Functional Planning Unit (HSFPU) was established in the Vice-president's office. Since the university has formal decision-making responsibilities, not only for the programmes on campus, but also for the programmes of the affiliated teaching hospitals, the HSFPU is intimately involved with the staff in the hospitals as well as the staff on campus.

While it is important for such staff groups to be responsible to the highest administrative officer in the institution, there is also a need for strong lines of

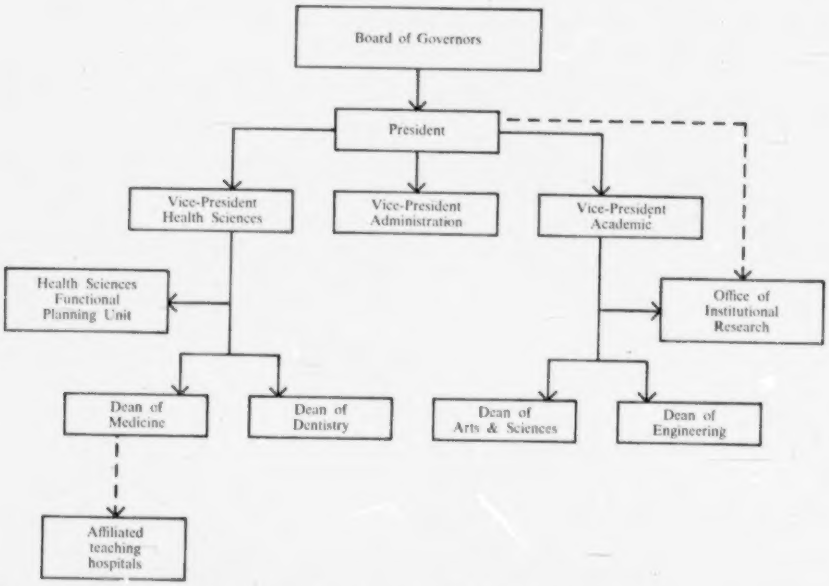

Board of Governors
President
Vice-President Health Sciences
Vice-President Administration
Vice-President Academic
Health Sciences Functional Planning Unit
Office of Institutional Research
Dean of Medicine
Dean of Dentistry
Dean of Arts & Sciences
Dean of Engineering
Affiliated teaching hospitals

FIGURE 10. *Organizational placement of analytical staff groups at the University of Toronto.*

communication downward into the academic departments. If the unit is isolated at the top of the university and does not have good liaison and active participation with the academic planners, it is doubtful whether the kind of information needed to make CAMPUS function can be obtained. The decision-making process in the university is iterative, but begins at the programme level and builds up under policy constraints to the top levels of the university.

3. *The direction of the staff group*

The leader of the internal group has two roles. One of these is liaison with the institution, in order to understand the relevant problems of the day, and relating back to the institution the results of the analysis carried out by his group. The second role involves the technical direction of the staff office. Both roles are important and, in a large institution, they should probably not be combined in one man. In other words, the director of the group would play a major liaison or co-ordinating role, and his associate director would be the technical chief.

While OIR has one director who plays both roles, HSFPU has this dual arrangement. A comparison of the effectiveness of the groups indicates that the approach of HSFPU is a more effective means of ensuring the successful grafting of this type of analytical office onto the institutional body—particularly in the early stages of development and implementation in larger institutions.

4. *Incentives to use CAMPUS*

The acceptance and encouragement by top administrators and the proper organization framework, though necessary, are more or less passive inputs into the sociological environment. What is needed is some positive incentive to use the techniques to their full advantage. The present trend towards fixed allotments to institutions from government agencies will undoubtedly be a strong incentive to the institution to consider carefully, and in the most sophisticated fashion, the range of alternatives open to it with such allocations. In this respect, CAMPUS creates an organizational and budgetary framework which is highly rewarding. Those who were reluctant to use it would be at a disadvantage in comparison with those who were not.

5. *Education of university personnel*

While the concepts that lie behind CAMPUS become simple and straightforward to the staff of the analytical group, they can remain a mystery to the majority of people within the institution. If often happens that even those who are enthusiastic about the new systems 'technology' are so for the wrong reason. Another, more familiar, problem is suspicion and fear that the use of CAMPUS represents some abdication of the decision-making and creative responsibility for the individual.

Educational programmes at several levels of detail are one way to cope with such problems. These include: (a) technical seminars on the basic techniques used; (b) presentations of the methodology explaining the basic kinds of problems which can be dealt with; (c) detailed presentations of case studies showing actual problems and the kind of analysis of these problems that was carried out; (d) gaming sessions in which the participants play various roles in the university budgeting and long-range planning process, and use the models to help them analyse various alternatives; (e) continuous efforts to ensure that those who are using the models understand the underlying concept and the relevance of the system to their immediate problem.

No person will use CAMPUS advantageously unless he has confidence in it, a confidence based on understanding what it is, and what it can and cannot do.

6. *The integration of the staff group into the university*

As with any new appendage of an organization, the staff group established to implement CAMPUS will have to prove itself and find its proper place in the 'informal' organization. To do this properly involves a balancing of two objectives that are often at odds with each other: expanding the energies of the group on studies with immediate pay-off, thus showing what it is capable of accomplishing

(1 to 3 months); and reserving the resources of the group for more productive work that will not show a pay-off for a period of time (3 to 18 months).

A comparison of the different methods followed by OIR and HSFPU is instructive in demonstrating how each sought to balance these two objectives.

OIR began by concentrating its efforts on the development of the model. But it soon responded to requests for specific short-term studies. As these were produced and appreciated by the administration of the university, the group gained in stature. However, with the passage of time, the office was deluged by similar requests from various executive offices of the University of Toronto and from the Committee of Presidents of Ontario Universities, and this work increasingly encroached upon the research and development programmes with a less certain and less immediate pay-off. This is not to say that the work being done was not of value; there seems to be no doubt that it was. Nevertheless, concentration on short-term staff work defers the development of newer and more effective management tools.

HSFPU took a more guarded approach. They did not carry out many short-term studies; the only ones that were produced were by-products of the main development effort. They sought to gain acceptance by immersing themselves in the planning process and attempting to make HSFPU, the model, the administration and the academics all part of an integrated effort. This interaction in trying out new alternatives in an iterative fashion has led to vastly improved decision-making. Furthermore, the faculty, being an integral part of the entire planning exercise, became enthusiastic and eager to explore alternative teaching and administrative policies using the CAMPUS model. This occurrence has dispelled the conventional view that the teaching staff is not concerned about the relative costs of various alternative educational plans. In fact, they became caught up in the 'game' and were even more anxious than the administrators to explore experimentally a few ideas by using the model. The fact that they frequently found educational plans of the same quality, as they perceived it, but of widely differing cost added to the interest of this exercise.

7. *Technical preparation and the staffing of the group*

The general CAMPUS concept seems to have wide applicability to institutions of higher education. However, it is not yet sufficiently generalized to be *directly* applicable to any institution. The organizational peculiarities of each institution demand some modifications of the basic model. The computers available to the university might also dictate certain changes in the programming of the system. Because of this fact, and the large data organization required in the first 3 to 12 months, a larger group of staff will be required initially than for the later operation of the system. It will often be desirable, in the initial phase, to utilize outside expertise. This might involve contracting out the technical systems development and initial implementation. But the on-going maintenance and use of CAMPUS must be the responsibility of an internal staff group. For smaller universities or colleges, the economics of the situation may be such as to preclude this. In this case the development and maintenance of the system should be contracted out, but the control over the input data, the problem definitions and presentation of results should still be carried out by institutional personnel.

The internal group can be made up of a team of people drawn from such disciplines as industrial engineering, computer science, economics, business administration, mathematics and social science, preferably with some understanding of computers. The size of the group will vary from two to ten programmer-analysts depending on the size of the institution. A mix of academic training and experience is most desirable. Dominance by persons trained in a single discipline can constrict the field of vision and reduce the effectiveness of results.

8. *The cost of implementing and using CAMPUS*

No hard and fast rules can be given for estimating precisely the cost of implementing and using CAMPUS. Much depends on the use to which the models are put, the data collection problem, the amount of education of the users that has to be undertaken, and a multitude of other conditioning factors. The cost will certainly be much less for newer institutions than for established ones. The figures in Table 15 have been arrived at by assuming that the institution is going to build on existing CAMPUS methodology and utilize people who can guide it in implementing it. The cost estimates are only approximate but would be about 25 per cent less if a group of similar institutions were to proceed together.

TABLE 15. Cost estimates of different types of institutions

Type and size of institution	Set-up cost	Set-up time	Operating cost per year
Junior College, Community College, Vocational School 0–3,000 students	$ 50 000	6 months	$25 000
College 3,000–8,000 students	$ 75 000	9 months	$35 000
University 8,000 and more students	$100 000	12 months	$50 000
Medical School and Teaching Hospital Complex	$ 75 000	9 months	$35 000
Elementary and Secondary School Board	$ 50 000	6 months	$25 000
A system of Post-Secondary Institutions	$100 000	12 months	$50 000

VII. Advantages of CAMPUS

The integration of complex factors into an analytical framework to aid practical decisions is the essence of systems analysis. The complexities of educational decisions can be characterized as follows: highly diverse investment choices; complex inter-relationships; long time-periods to measure impact; highly dynamic and uncertain environments; and measurement problems. The long time-period over which educational policies take effect increases the complexity of investment choices in a given year by the necessity of linking them with future and past decisions. In addition, a long period elapses before any evaluation of plans is received. A poor allocation may not only start a programme in the wrong direction, but it may also delay by years the experience and knowledge necessary to determine the appropriate corrections. Thus, it is extremely important that the implications of a decision upon the future be carefully evaluated before the decision is finally made.

Information on the future is fraught with uncertainty, but decisions have to be made in any case, and administrators should make their decisions in the light of the best information available. CAMPUS, as portrayed in Figure 11, is an attempt to organize such information in the most meaningful way. According to recent work by Pfeiffer[1] and Roth,[2] CAMPUS is the most advanced system that has been developed for this purpose. The following points are intended to summarize the advantage that can be gained by using it.

1. *Planning rather than responding*

The ability to experiment with 'alternative futures' should allow the planner to devise plans which are less sensitive to adversities. The simulation model can serve as a laboratory in which the university administration can test alternative policies before decisions are made. The experimental results of such testing will provide objective estimates of the resource implications of alternative proposals. Such information would be a healthy check on unsupported departmental proposals, and would bring about more careful planning at all levels. Better knowledge of the cost consequences of alternatives should improve decision-making and reduce the number of unfortunate surprises in university planning.

2. *More comprehensive justification of budgets*

The use of computerized simulation models makes possible more accurate and substantiated statements of financial requirements, and this should improve the

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[1] J. Pfeiffer, *A new Look at Education: Systems Analysis in our Schools and Colleges*, New York, Odyssey Press, 1968.

[2] G. J. Roth, 'Management Science in University Operation', *Management Science*, Vol. 14, No. 6, Northwestern University, February 1968.

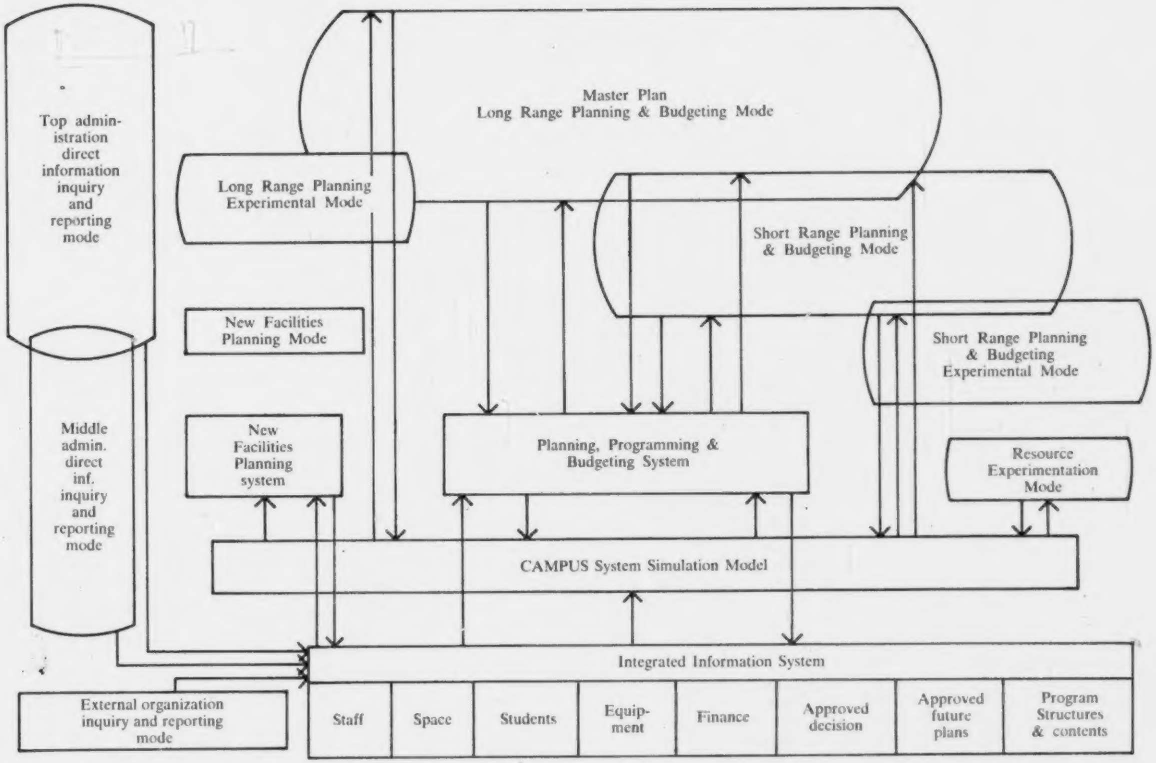
Top administration direct information inquiry and reporting mode
Middle admin. direct inf. inquiry and reporting mode
External organization inquiry and reporting mode
Master Plan
Long Range Planning & Budgeting Mode
Long Range Planning Experimental Mode
New Facilities Planning Mode
New Facilities Planning system
Short Range Planning & Budgeting Mode
Short Range Planning & Budgeting Experimental Mode
Planning, Programming & Budgeting System
Resource Experimentation Mode
CAMPUS System Simulation Model
Integrated Information System
Staff
Space
Students
Equipment
Finance
Approved decision
Approved future plans
Program Structures & contents

FIGURE 11. *CAMPUS: the various modes in which the system can be used.*

institution's position in the competition for public funds. The results of a simulation can be presented either in traditional budgetary formats, or in such a way as to juxtapose programme levels and associated costs. A particular advantage of the model is its ability to compute the incremental costs of altering each activity level. This should facilitate a more efficient allocation of university resources and public funds. An important advantage, which emerges as a by-product in the university budget-making process by CAMPUS, is that top-level budgetery negotiations become less concentrated on aggregate funds, and more concentrated on the underlying decisions, which, presumably, are of more fundamental importance.

3. *Quicker, cheaper, less tedious planning*

Laboriously produced 'master plans' are often obsolete before their ink is dry, whereas simulation models permit continuous planning in response to changed circumstances and opportunities. Also, the use of such models obviates the investment of scarce managerial time and talent in slow manual computations. Because of paucity of information, an impending decision of any consequence in the university is likely to initiate a search for new data, and this places a heavy burden on deans and departmental chairmen who must supply this information. Moreover, as these data are often supplied hastily, their quality is frequently dubious. Typically, the results of one survey are unavailable for or inappropriate to the next. Such a procedure is wasteful and cannot provide uniformly good information. Because it systematically brings together and analyses information relative to a broad class of problems, the simulation model should reduce this tedious and repetitious paper work.

4. *Aiding universities in the early expansion stages*

Universities in the early growth stage stand to profit greatly from the use of simulation models. The range of decision variables is so broad and the importance of early decisions so great that the planners deserve all the assistance they can get. The design and use of a simulation model in the formative stages of university planning may avoid costly errors and raise the return on new educational investment.

5. *Aiding government departments*

At the government level, the potential rewards of simulation models would appear to be very great, since the task of scrutinizing and analysing university budgets and statements of financial needs can be greatly facilitated. It is likely that government officials would have greater confidence in the wisdom of their decisions if these rested upon objective analysis of the type obtainable from simulation models.

VIII. Conclusion

Central to the entire experiment of using systems analysis for university planning and management is the notion that better information in the hands of decision-makers means better decisions. Given the proper attitude on the part of the administration and the analysts, it is possible, with the present CAMPUS technology, to make marked improvements in the quality of decision-making in higher education, thus ensuring more efficient utilization of the resources that universities have at their disposal.

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Morocco *24*

Costs of public secondary education: analysis of the results of a governmental survey

prepared by J. Proust

The author of this case-study, Mr. J. Proust, Unesco expert in Morocco, has prepared this report on the basis of a survey conducted by the Planning section of the Ministry of education, Morocco. In order to clarify and discuss some issues, the IIEP (Messrs. P.H. Coombs, J. Hallak, and C. Tibi) have added several observations and comments in footnotes and also a general commentary at the end of the study.

Introduction

The Committee on Human Resources of the Planning Division decided to make a study of costs and to analyse their components in secondary education in order to:

1. Verify the economic feasibility of the education plan and recommend any necessary financial adjustments or make changes in qualitative targets.
2. Provide a realistic basis for the preparation of a request to the International Bank for Reconstruction and Development for the financing of part of the capital investment for secondary education, based on an itemized study of building costs.
3. Find ways of making the most profitable use of educational resources by means of an analysis of cost components, taking into account pedagogical requirements.

In particular, the study intended to produce accurate information on two points: first, the total cost per pupil according to the size of the school; second, the utilization of the science teaching equipment in the schools.

The only study previously carried out on educational costs was in 1965 and began with the following statement: 'The components of educational cost must be better understood; budget provisions do not provide adequate information for this purpose.'

The budget cannot be used to provide information on real cost components, because it is too disaggregated. In fact, until last year, as soon as the budget was accepted, the central administration divided the available funds between four different departments of the central administration itself, six different directorates and seventeen provincial delegations. The directorates and provincial delegations were responsible either for allocating these funds themselves or sub-dividing them among the schools. Thus, although it was possible to determine how funds had been divided among different users, it was impossible to determine the amount of funds actually used, and the distribution of expenditure between different objects or functions. An unsuccessful attempt to obtain this information was made early in 1968.

Moreover, not having final accounts, but only the budget estimates, it was impossible to get completely accurate data. Taking the year 1967 as an example, the funds still available on 31 December 1967 amounted to more than 10 per cent of the budget allocations.

This problem did not arise in the case of capital expenditure, because the extreme centralization of operations, from planning to construction, made it possible to study building costs.

It therefore became clear that the problem had to be studied at the level of the users directly concerned, i.e. the schools themselves. A survey was thus undertaken with a sample of schools, and the principal results of that survey form the basis of the present study.[1]

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[1] The inquiry was conducted by the Planning Division of the Moroccan Ministry of national education, which has guaranteed its reliability. It required the combined efforts of leading

The study includes: a general outline of the method followed in the survey (Section I); a summary of the principal statistical results obtained (Section II); a general analysis of costs in the schools examined, with particular reference to the cost of equipment[1] (Section III); a comparison of the average costs obtained in this way with the costs of a current building programme financed by IBRD (Section IV); and a commentary on cost trends of secondary schooling provided for in the plan (Section V). A commentary by IIEP on the study is included (Section VI).

I. Methodology

As already noted earlier, this report is devoted essentially to a study of costs and an analysis of their components in public secondary education, which represents 86 per cent of all secondary education in Morocco.

Some of the costs result from expenditures made in the schools themselves, and were revealed by the fact-finding survey conducted in the schools. Other costs could not be determined on the basis of the information available in the schools themselves, as they were expenses incurred for general administration and for common services; such costs were estimated on a global basis. Expenditure for educational purposes made directly by families also had to be included, and was estimated on the basis of a study conducted at different social and economic levels in Casablanca.

It was impossible to conduct an exhaustive survey into the expenditure of all the 230 public secondary schools in Morocco, so it was decided to study a representative sample. As one of the objects of the survey was to determine the cost per pupil in relation to the total capacity of the school, five different sizes of schools were to be included in the sample, which consisted of: 2 schools of less than 400 pupils; 2 schools of 400 to 800 pupils; 8 schools of 800 to 1,200 pupils; 7 schools of 1,200 to 1,800 pupils; 4 schools of more than 1,800 pupils. This made

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officials of the Ministry, particularly the Equipment Division, as well as the heads of the Regional Planning Offices, Directors, Superintendents and other school officials, some of the teachers of the schools included in the inquiry, school architects, land registry offices, and many other persons. About a hundred persons actively participated in obtaining data, which required three months of preparation, two months for the inquiry itself and two months for the processing and synthesis of the data.

[1] The present study, aimed at estimating and analysing costs, is based on the sample survey of secondary schools in Morocco which was prepared basically to make a loan request to IBRD in order to finance investment in secondary education. For this reason, the main emphasis was placed on equipment costs; operating costs were not estimated or analysed in very great detail. (IIEP).

a total of 23 secondary schools, amounting to 10 per cent of the total for the country.

However, it proved impossible to use a random sample, as it was necessary to include only fully developed schools, in order to obtain stable estimates of cost. This eliminated a fairly large number of newly built schools, since secondary education is still rapidly expanding. It was necessary to have access to the records of construction costs for the schools examined. Thus the choice of 23 schools had to be made from an initial selection of only 46 secondary schools of the five sizes decided upon.

These 23 schools consisted of: 15 co-educational schools; 5 schools for boys; 3 schools for girls. Thirteen were providing only the first cycle (Junior High School equivalent), while the other 10 offered the complete secondary school cycle. Eight of these 23 schools had technical sections (vocational high school), but three of them were due to be closed as a result of a reform which defers technical education to the second cycle.

These 23 schools had 29,735 pupils out of the total of 228,837 secondary school students in Morocco. The girls numbered 7,312 out of the total of 53,423 girls attending public secondary schools in the whole country. The sample was representative in terms of the cycles of study, with 26,503 first cycle pupils out of the national total of 206,848 and 3,232 second cycle pupils out of the national total of 21,989.[1]

The school construction bureau listed the different stages of construction with the cost commitments and the numbers of the contracts awarded. On the basis of this information, the accounting service looked up the payment vouchers, thus determining the expenditures actually effected. For some of the construction jobs dating from the period 1949–59, only the contractors' tenders (bids) were available, because the accounting records are kept for only 10 years.

Whenever an item of cost was not available, a corresponding replacement cost was used, but it proved possible to reconstitute 98 per cent of the capital outlay for the schools thanks to the efficiency of the Equipment Division and of its School Construction Bureau in particular.

An effort was made to minimize the number of doubtful estimates, so for some schools the idea of calculating total cost was abandoned and the investigators simply determined a certain number of cost components comparable to those of the other schools.

After determining these components of total cost, it was necessary to classify each item of school expenditure in terms of three cost components; building costs, equipment costs and operating costs. This initial breakdown of expenditures was comparatively simple because it corresponded with the budget distribution. The first difficulties arose when it became necessary to divide these components according to their function; school administration costs, teaching costs and boarding costs.

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[1] It is worth emphasizing here that this method of sampling was not very satisfactory statistically, as it was not a random sample. There is a very clear bias, for the 10 per cent of the schools covered included 13 per cent of the total number of pupils (13.7 per cent of the girls); therefore, the schools were larger than average. On the other hand, the distribution of the sample between first-cycle schools and second-cycle schools is more representative. The data cover mainly large schools situated in urban areas, as opposed to small schools situated in rural areas. The interpretation of the results therefore demands great care. (IIEP).

For purposes of comparison between schools, it was necessary to include in administrative costs, all expenditure which was necessary for the normal conduct of the non-boarding element and to classify under boarding costs all expenditure on the administration of the school which was due to the presence of boarding pupils. Thus, rooms used for the catering services were assigned to boarding costs, as were pupils' lounges. Estimates had to be made to distribute the water and electricity charges, for example, by reference to schools of similar size and structure but without boarding pupils. It was also necessary to take separate account of the equipment specifically used for technical instruction.

In short, a record was prepared for each school on the following plan:

1. Statistical data for 1967/68 covering the pedagogical structure, non-boarding pupils and boarding pupils, the latter divided into scholarship pupils and fee-paying pupils.
2. Data for 1967/68 covering the administrative staff, teaching staff and boarding school personnel.
3. Results of examinations at the end of the 1968 school year.
4. Pupil flows for at least the past six years.

In addition, cost data were collected as follows:

1. Building costs (capital outlay) for the school complex, including any premises which may have been acquired with the land (for example, a primary school ceded by France when granting independence to Morocco). However, the cost of the land itself did not enter into the calculation of imputed rent. These costs were divided as mentioned above into: administrative costs of school and staff quarters[1]; tuition costs; and boarding costs.

This cost breakdown was possible because the Equipment Division listed the buildings constructed each year, with their costs, and the schools supplied a list of premises by function, with the date of construction and the room dimensions. The expenditure could then be divided on a *pro rata* basis according to the areas of the rooms, allowing for the higher cost per square metre of living quarters and specialized rooms or halls. In fact, for rooms of this latter type it was nearly always possible to calculate the cost from official statistics, because this type of construction requiring special arrangement was nearly always the object of a separate contract in the construction of the schools concerned. Actually, it was possible to break down the capital outlay, for boarding schools, into: classrooms for general instruction; rooms for scientific instruction; rooms for technical instruction; and premises and installations for sports and recreation.

Unfortunately the number of schools where this distinction could be made was too small for purposes of generalization. This part of the study will be mentioned again later.

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[1] When an employee of civil servant status is provided with quarters he no longer receives a housing allowance.

The utilization of these building costs raised a number of problems. Was it logical to estimate amortization of the capital invested, as is done in the private sector, although public accounting does not use that procedure? Or should an estimate of rental be made corresponding to the rent which the school administration would have had to pay if the buildings had been hired from private owners? The principle of including a theoretical rental charge in calculating the cost per pupil was discussed at length, and it was generally admitted by the Planning Division that investment in education by the state, although profitable on a long-term basis, represents in the short run the loss of alternative options in some other sector of the economy. Moreover, capital investment in school premises deteriorates rapidly. It is practically certain that school buildings constructed now will no longer be usable in their present form within a few dozen years owing to the spread of modern teaching methods.

It therefore seemed necessary, in order to allow for the opportunity cost to the state, the rapid obsolescence of the buildings, and other secondary factors such as comparability between schools, to calculate an *annual imputed rent*, based on the total amount of the capital outlay. But it was not thought necessary to use an elaborate method of calculating the amortization in view of the approximate nature of the imputed rent estimate, and it was therefore considered sufficient to apply a constant amortization over a period of 50 years, without interest on the capital.[1]

This imputed annual rental charge was divided by the number of pupils in order to obtain the annual rent per pupil. (The boarding school rent was divided by the number of boarding pupils, and as the number of pupils on half board was very low, this category was classified as non-boarding.)

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[1] This method of estimation is rather crude. In fact ,the calculation assesses only depreciation, and not amortization as usually defined. This is surprising, in view of the fact that the opportunity cost of capital was specifically mentioned in the study. It would have been preferable to estimate the annual rental charge by amortizing the investment with a positive interest rate, for example, 6 per cent, which is the rate used by IBRD, in view of the fact that the cost analysis was made to prepare an IBRD loan project request.

In this case, the annual rental charge would be equal to 6.3 per cent of the capital, as against the 2 per cent used in this study. This is a very significant difference in the estimation of the imputed rent.

Another important methodological issue concerns the method of computing the total capital cost for all the schools in the sample. These schools were built over several years and the authors have simply added the nominal amount of expenditure incurred during these years, which results in an underestimation of the cost of the older buildings. An aggregate cost of the various school buildings, expressed in terms of constant prices, would have been more satisfactory. For example: school number 12 had new buildings constructed over the period 1952–68. We have calculated the building cost in terms of constant 1968 prices, assuming a 5 per cent increase in the price index per annum since 1952. The total cost obtained is 1,015,000 DH as against the 559,000 DH assumed by the authors. This means that the annual rental charge should be increased from 11.4 to 17.8 DH and, assuming 6 per cent interest for amortization, becomes 56.4 DH. This is almost five times the annual rental charge used by the authors of the study. (IIEP).

Exchange rate July 1969 : 5.02 DH = US$ 1

2. *Equipment costs* were divided into two categories, considering the specific nature of the equipment and the different degrees of durability, as follows: *Furniture*, also distributed under the three headings: Administration, Tuition Use, and Boarding School Use; and *School materials*, including: office machines, etc. for school administration; regular tuition material— textbooks and other classroom material including scientific, audio-visual, recreational and artistic equipment.

The utilization of the equipment costs was worked out on the same principle as the imputed rental charge by assuming a life of 20 years for the furniture and 10 years for the school materials. The enquiry conducted for this study showed clearly that these durations are maximum periods which are rarely attained.[1]

3. *Operating costs* are undoubtedly, by their very nature, the most inaccurate in their functional breakdown. It was often impossible to distinguish between the shares of electricity consumed by the non-boarding pupils, the boarding pupils and the administration. The same applies to telephone charges and many other expenses.

The analysis of these costs is not an essential part of this study, but their importance, so often neglected in educational planning, makes it necessary to devote at least a few lines to them.

On completion of the inquiry, the following data were available:

(a) data collected from the Ministry of National Education:
  budget for 1967/68;
  funds allocated for secondary education;
  amounts assigned to general administration;
  capital outlay for construction costs of the 23 sample schools since 1949;

(b) data collected in the 23 schools:
  detailed list of rooms, showing the use made of them in 1967/68, amount of floor space and the date of construction;
  inventory of furniture and school materials showing the purchase price or replacement cost and age, divided according to use (administration, tuition or boarding);
  list of teachers in 1967/68 showing names, titles or positions, total amounts received in salaries and allowances, and any benefits in kind.

With this information it was possible to draw up a table of cost elements per pupil for each school. The relative share in the Ministry's general expenditure on administration and inspection then had to be calculated, plus private costs covered by the families and not included in the school accounts, in order to estimate the total annual cost per pupil. At the same time, a calculation was made of the theoretical cost in a school of recent construction financed by IBRD.

Finally, in order to verify the building costs, a number of contracts relating to other schools not included in the sample were examined.

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[1] The remarks made concerning building cost and the annual rental charge hold true also for equipment costs; the study in fact uses depreciation rather than imputed rent. (IIEP).

II. Statistical results

Itemized data relating to the 23 schools covered by the inquiry, and also the budget items necessary for a close understanding of the situation, are given in the Appendix to this report.

Thus, at this point we shall give only a general summary of the results obtained. Table 1 summarizes the average costs per pupil, which will later be analysed in Section III. This summary table is followed by a more detailed analysis of average costs, section by section.

TABLE 1. Average costs per pupil in Moroccan secondary schools, 1967/68 (in DH)

	Administration		Tuition		Totals		Extra cost for boarders
	First cycle	Complete cycle	First cycle	Complete cycle	First cycle	Complete cycle	
1. Building costs	1.10	1.32[1]	11.90	19.01[1]	13.00	22.68[1]	45.81
2. Equipment costs							
Furniture	0.21	0.46	2.17	4.00	2.38	4.46	22.13
Material	0.36	0.63	1.01	9.33[2]	1.37	9.96[2]	6.42[2]
Total	0.57	1.09	3.18	13.33[2]	3.75	14.42[2]	from 26 to 30
3. Operating costs							
Material	2.00[2]	2.00[2]	9.45	13.70	11.45	15.70	805.23
Staff	72.60	130.00	548.48	831.02	621.08	961.02	413.69
Total	74.60	132.00	557.93	844.72	632.53	976.72	from 1 218 to 1 369
Totals of 1 + 2 + 3	76.27	134.41[1]	573.01	877.06[1]	649.28	1 013.82[1]	approx. 1 400
4. Min. of Nat. Education administration expense	7.50	7.50	—	—	7.50	7.50	
5. Share of common State expenditure	22.00	22.00	—	—	22.00	22.00	
6. Cost per pupil from public funds	105.77	163.91	573.01	877.06	678.78	1 043.32	
7. Minimum private expenses					100.00	130.00	
8. Minimum annual per-pupil cost of secondary schooling					780[3]	1 200[3]	

1. The sum of the figures given under administration and tuition does not agree with the figure given under totals, the reason being that the average estimated for the two (administration and tuition) excludes school No. 16, for which the breakdown of the costs between administration and tuition was not available.
2. Estimated.
3. Rounded.

TABLE 2. Building costs for administration and tuition in secondary schools by size of school: imputed rent per pupil, 1967/68 (in DH)

School No.	Theoretical capacity	No. of pupils in 1967/68	Imputed rent per pupil[1]	Share attributed to: Administration	Share attributed to: Tuition
First cycle only					
1	500	387	10.80	0.77	10.03
2	800	473	38.83	1.75	37.08
3	800	697	14.47	1.63	12.84
4	880	749	15.51	1.12	14.39
5	760	911	7.94	0.58	7.36
6	1 120	934	11.34	0.59	10.75
9	1 120	1 030	13.18	0.83	12.35
11	1 640	1 140	(16.32) 15.73	2.48	13.25
13	1 120	1 225	13.43	1.10	12.33
17	1 880	1 510	17.07	1.30	15.77
18	1 880	1 708	9.49	0.81	8.68
19	1 480	1 723	9.48	0.93	8.55
22	2 320	2 366	10.57	0.65	9.92
	16 300	14 853			
Average cost (after weighting)			13.00	1.10	11.90
Average cost with maximum utilisation (situation as of 1968/69)			12.00		
Median			13.18	0.93	12.30
Complete cycle					
7	1 134	1 009	(12.69) 10.60	0.56	10.04
8	1 120	1 018	21.04	1.87	19.17
10	1 180	1 046	(32.55) 21.35	1.61	19.74
12	1 020	1 141	12.17	0.78	11.39
14	1 480	1 354	(37.12) 24.58	1.18	23.40
15	1 600	1 413	(23.75) 22.85	1.89	20.96
16	2 000	1 452	38.45	...	...
20	1 880	1 931	(12.02) 11.36	0.60	10.76
21	2 780	1 983	33.97	2.74	31.23
23	2 480	2 534	...	...	...
	16 674	13 981			
Average cost			22.68	1.32[2]	19.01
Average cost with maximum utilisation			19.65		
Median			from 21.00 to 21.50	from 0.98 to 1.10[2]	from 17.74 to 19.17

1. Without living quarters. Figures in brackets show imputed rent with living quarters.
2. Without living quarters

... Data not available

NOTE The unit costs estimated in this table correspond to rates of utilization of school premises varying from school to school — from 59 per cent to as high as 120 per cent (in school No. 5). Although, when trying to estimate real costs, it is quite usual to relate the expenditures to utilized places, the comparison between the unit costs in various schools becomes easier if the estimate is made per *existing* place rather than per *occupied* place.

Table 3. Extra building costs for boarding secondary schools: cost per pupil, 1967/68 (in DH)

(a) Variation with increase in size of school

	Schools in order of increasing size											
	1	4	5	6	7	8	10	14	15	18	20	21
Annual imputed rent per boarding pupil:												
First cycle only	8.41	43.88	70.00	10.59						45.40		
Complete cycle					56.54	46.06	57.80	29.71	115.18		44.08	70.86

(b) Variation with increase in number of boarding pupils

	Schools in order of increasing number of boarding pupils													
	5	18	6	1	4	20	23	15	8	9	7	14	10	21
Number of boarding pupils	53	69	80	120	157	171	182	191	210	218	308	333	346	389
Annual imputed rent per pupil	70.00	45.40	10.59	8.41	43.88	44.08	. . .	115.18	46.06	. . .	56.54	29.71	57.80	70.86

Average cost (after weighting): 45.81 DH. Median: 46.00 DH approximately.

... Data not available

1. *Building costs*

Table 2 shows that the administration share of building costs in some schools can be as much as five times larger than in others. The per-pupil costs of rooms used for administrative purposes do not vary appreciably between complete cycle schools and those giving the first cycle only, but the building cost of classrooms is substantially higher on average in the complete cycle schools. The annual imputed rent per pupil in secondary schools is in fact only 13 DH in a first-cycle school and 22.68 DH in a complete cycle school. (It should be remembered that rooms specifically devoted to technical education are not included in these costs.)

TABLE 4. Furniture costs for administration and tuition in secondary schools; cost per pupil, 1967/68 (in DH)

School No.	Imputed rent per pupil	Share of imputed rent attributed to administration	Share of imputed rent attributed to tuition
First cycle only			
1	2.90	0.40	2.50
2	4.00	0.20	3.80
3	2.91	0.44	2.47
4	3.12	0.19	2.93
5	2.88	0.35	2.53
6	2.56	0.30	2.26
9	2.22	0.15	2.07
11	1.99	0.30	1.69
13	2.25	0.19	2.06
17	3.36	0.23	3.13
18	2.23	0.16	2.07
19	1.63	0.17	1.46
22	1.68	0.08	1.60
Weighted average cost	2.38	0.21	2.17
Average cost with maximum utilization	2.17		
Complete cycle			
7	3.82	0.47	3.35
8	3.62	0.19	3.43
10	3.66	0.32	3.34
12	3.42	0.40	3.02
14	2.86	0.33	2.53
15	...	...	...
16	4.35	0.80	3.55
20	2.31	0.27	2.04
21	5.85	1.00	4.85
23	2.83	0.56	2.27
Average cost	4.46	0.46	4.00
Average cost with maximum utilization	3.86		

... Data not available.

TABLE 5. Extra furniture costs of boarding secondary schools; cost per pupil, 1967/68 (in DH)

School No.	5	18	6	1	4	20	23	15	8	9	7	14	10	21
No. of boarding pupils	53	69	80	120	157	171	182	191	210	218	308	333	346	389
Imputed rent per pupil	17.38	18.78	19.05	24.82	19.08	18.07	36.40	...	20.51	...	22.61	29.11	12.97	22.07

Average cost (after weighting): 22.13 DH. Median: 20 DH.

... Data not available

Table 3 shows that for boarding schools there is no definite fixed relationship between average costs and the size of the school. For the entire sampling of such schools the weighted average extra cost per boarding pupil was established as 45.81 DH and the median at 46 DH.

2. *Equipment costs*

(a) Furniture

The imputed rent per pupil for furniture, calculated on the basis of a duration of 20 years, varies as shown in Table 4.

TABLE 6. School materials costs for administration and tuition in secondary schools; cost per pupil, 1967/68 (in DH)

School No.	Imputed rent per pupil	Share of imputed rent attributed to administration	Share of imputed rent attributed to tuition
First cycle only			
1	2.82	0.78	2.04
2	0.68	0.10	0.58
3	1.91	0.29	1.62
4	1.34	0.50	0.84
5	1.93	0.42	1.51
6	0.56	0.30	0.26
9	1.09	0.31	0.78
11	2.44	0.27	2.17
13	1.07	0.45	0.62
17	1.78	0.32	1.46
18	1.56	0.83	0.73
19	0.94	0.32	0.62
22	0.95	0.08	0.87
Weighted average cost	1.37	0.36	1.01
Median	1.34	0.32	0.84
Complete cycle			
7	...	0.72	...
8	1.57	0.59	0.98
10	...	0.58	...
12	...	0.56	...
14	...	0.44	...
15	...	...	...
16	...	0.74	...
20	...	...	...
21	14.29	0.71	13.55
23	...	...	...
Weighted average cost	...	0.63	...

... Data not available.

These extra costs for boarding schools (see Table 5) vary with the number of pupils but no relationship could be established between the size of the schools and the imputed rent for furniture per pupil. The weighted average cost per pupil was 22.13 DH, with a median of 20 DH.

(b) School materials

The imputed rent for school materials per pupil, calculated on the basis of a duration of 10 years, is shown in Tables 6 and 7.

TABLE 7. Extra school materials costs of boarding secondary schools; cost per pupil, 1967/68, (in DH)

School No.	18	6	1	4	7	10	21
Cost	4.13	2	11.64	7.52	2	7.36	8.38

The details of the cost of materials in secondary schools are very incomplete, in particular in schools offering the complete secondary curriculum. Only very rarely did the school inventories show the purchase prices paid for materials. It might have been possible to use replacement costs, but that was not of much value owing to the state of under-equipment of the schools, especially in scientific instruction materials. Only one school appeared to be well equipped, namely school No. 21, for which it was possible to determine imputed rent per pupil for materials; this amounted to 13.55 DH for instructional materials, of which 6.25 DH was for texbooks.

However, for the requirements of this study, an estimate based on a cost of 2 DH per pupil for schools having only literary sections, and 10 DH for those having scientific sections in the second cycle, will be used in the remainder of our summary tables.

The extra cost of materials for boarding schools was also calculated (see Table 7), but as in the case of the general school materials, it was usually difficult to ascertain the prices which had been paid and therefore the results apply only to seven schools and should be interpreted with caution.

Here also the costs vary with the number of boarding pupils, although no definite relationship could be established between imputed rent for materials per pupil and the size of the school in such a small sample. The weighted average is 6.42 DH, and the median is 7.32 DH per pupil.

3. *Operating costs*

(a) Materials

As in the case of the building and equipment costs, an attempt was made to divide the expenditures between administrative and instructional costs by distinguishing staff operating costs from material operating costs. Although this distribution is

TABLE 8. Operating costs (material) for administration and tuition in secondary schools; cost per pupil, 1967/68, (in DH)

School No.	1	2	3	4	5	6	9	11	13	17	18	19	22
First cycle only													
Cost per pupil	22.54	21.06	11.28	12.21	13.93	8.42	14.05	12.78	17.68	5.26	9.22	8.75	10.30
School No.				7	8	10	12	14	15	16	20	21	23
Complete cycle													
Cost per pupil				30.18	5.56	32.38	19.08	18.22	. . .	. . .	13.10	11.26	9.65

Average costs: first cycle only, 11.45 DH.; complete cycle, 15.70 DH.

... Data not available

TABLE 9. Extra operating costs (material) for boarding secondary schools; cost per pupil, 1967/68 (in DH)

School No.	1	4	5	6	7	8	9	10	14	18	21	23
Cost per pupil:												
First cycle	581	552	486	406			665			597		
Complete cycle					470	746		903	1 199		1 067	875

Average: first cycle only, 575 DH.; complete cycle, 896.80 DH.; over-all, 805.23 DH.

easy to make, the initial breakdown, especially for material operating costs, is very hazardous, and it seemed advisable to consider administration and instructional costs together (see Table 8).

The extra material operating costs for boarding schools are shown in Table 9. The average costs are; 575 DH for first-cycle schools, 896.8 DH for complete-cycle schools, and 805.23 DH for both types.

(b) Staff

As far as operating costs are concerned, staff salaries are the major item, and while it was possible to distinguish between the salary cost of the teaching staff and that of the administrative and service personnel, the total expenditure on salaries was in some cases slightly understated, due to the fact that certain expatriation allowances or premiums paid to foreign personnel by their country of origin were not included in the data (Table 10).

TABLE 10. Operating costs (staff); cost per pupil, 1967/68 (in DH)

School No.	Administrative staff		Teachers' salaries and allowances		Boarding school staff	
	First cycle	Complete cycle	First cycle	Complete cycle	First cycle	Complete cycle
1	124		527		551	
2	173		753			
3	81		622			
4	64		491		321	
5	62		577		327	
6	69		526		387	
7		...		...		...
8		102		435		242
9	79		337		388	
10		129		893		241
11	...		...			
12		81		711		
13	45		608			
14		113		593		480
15		...		...		
16		194		887		
17	140		600			
18	41		552		513	
19	52		560			
20		95		564	334	
21		173		1 450		641
22	50		520			
23		...		...		...
Average cost	72.60	130.00	548.48	831.02	413.69	

... Data not available

4. *General educational administration expenses*

The expenditure of the National Education Ministry for the central administration, provincial delegations, inspection of schools and other common services was not accurately known. The budget allocation for central administration amounted to about 10 million DH in 1968, representing an average cost per pupil of approximately 7.5 DH.

5. *Share of common state expenditure*

As under the previous heading, it was difficult to obtain very accurate data on this subject without special investigations outside the scope of this inquiry. The average cost was approximately estimated, however, at 22 DH regardless of the cycles of secondary schooling.

6. *Minimum private expenses*

A study of the minimum amount which a secondary school pupil must spend each year was conducted in seven schools at Casablanca, three of them girls' schools, in different social and economic environments. These private expenses include matriculation fees, cost of equipment for sports and games, photographs for the school records, charges for correspondence with the family, library fees and, in some schools, a charge for notebooks; such expenses are common to all school pupils. In addition a charge is levied on each pupil for the various subjects of the curriculum, and this varies according to the pupil's course of study.

These charges on the families are summarized in Table 11.

TABLE 11. Private expenditure, per pupil, 1967/68, (in DH)

	General charges	Specific charges	Annual total
Boys			
First year ('Observation class')	10 to 29	50 to 53	63 to 76
Second year	10 to 29	60 to 65	85 to 95
Third and fourth years	10 to 29	71 to 93	87 to 112
Fifth and sixth year	10 to 29	100 to 170	130 to 185
Seventh year	10 to 29	100 to 170	130 to 185
Girls			
First year ('Observation class')	36 to 57[1]	60 to 75	95 to 110
Second year	36 to 57	75 to 90	120 to 140
Third and fourth years	36 to 57	80 to 144	144 to 190
Fifth, sixth and seventh years	36 to 57	...	...

[1] This higher expense for girls is partially due to the obligatory blouse for the girls.

NOT These expenditures relate to Casablanca alone and should therefore be considered as higher than the national average (IIEP).

To these school expenses must be added, the cost of transportation for many pupils. At least 2,150 of the 29,735 pupils attending the sample schools travelled by bus to get to school, using a reduced rate monthly card costing 10 DH. That amounts to a total expense of 193,500 DH per school year, and represents an average of 0.65 DH per pupil for the entire system.

With the exception of the cost of the obligatory blouses for girls, it was not possible to calculate the expenses for clothing, or other non-obligatory expenses, although they are to some extent directly connected with school attendance.

In short, the family expense in an urban environment for a non-boarding secondary school pupil averages 100 DH per annum for boys and 120 DH for girls.

The costs to boarding pupils vary, of course, with the amount of their scholarships. Boarding costs range from 786.60 DH in the first cycle to 873 DH in the second cycle. To this must be added the cost of the personal kit required of the pupils by the boarding school, varying from 100 DH to 500 DH (for the girls).

III. Cost Analysis

1. *General remarks*

The itemized tables given in the preceding chapter show quite clearly that there is no relationship between the size of a secondary school and the cost per pupil per year, and that this cost is much higher in some schools than in others.[1]

For example, the complete-cycle school No. 21 shows a per-pupil cost of 1,750 DH, against an average of 1,025 DH in that category, and fully one-third more than the most expensive of the other full-cycle secondary schools giving science courses. This may be partly explained by the fact that 67 per cent of the teaching staff were foreigners and that the qualification level of all the teachers was high, 53 per cent holding a university degree. By way of comparison, the proportion of foreigners for the entire modern public education system of Morocco was 41.8 per cent, and the proportion of teachers having qualifications equivalent to those mentioned above was about 35 per cent.

It is interesting to note that in spite of its 70 per cent higher cost, this school has the same output of graduates as the national average—36.5 per cent, as against 36 per cent.

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[1] It would be premature to draw the conclusion that there are no economies of scale, particularly because the sample was not representative in terms of size. As a matter of fact, in so far as equipment costs are concerned, it is clear that the school buildings studied were not built on the basis of pre-established norms, and that they have been extended progressively in a non-homogenous way (prefabricated materials in some cases) and sometimes under special conditions using, for example, cheap manpower. These various factors lead to a great variety of building costs which eventually can disguise economies of scale. (IIEP).

On the other hand, some of the first-cycle schools show such an extremely low per-pupil cost—less than 500 DH per year—that it is questionable whether it is possible to provide efficient instruction at such a low rate—only 68 per cent of the average cost.[1]

Although international comparisons of the costing and financing of education are extremely difficult, it is certain that the average costs revealed in Morocco are quite low. It should be pointed out that the average expenditure by the state per pupil for general secondary education is roughly equivalent to the *per capita* GNP (U.S.$ 170), while in industrialized countries the ratio is approximately one-seventh (France) to one-eight (U.S.A.). On the other hand, in some of the developing countries, the ratio has been reversed (4/1 in Senegal in 1964).

An analysis of the unit cost per pupil is given in the following pages. Some remarks will be made concerning the operating costs, which constitute the greater part of the total costs, but the study will deal particularly with the building and equipment costs.

2. *Average over-all cost*

780 DH per pupil in first-cycle secondary schools, divided as follows:
649.28 DH for the school
7.50 DH for administration and inspection (Ministry of nat. edn.)
22.00 DH for central government expenditure
100.00 DH for the families

1,200 DH per pupil in complete-cycle secondary schools, divided as follows:
1,013.82 DH for the school
7.50 DH for administration and inspection (Min. of nat. edn.)
22.00 DH for central government expenditure
130.00 DH for the families

In examining the dispersion, we shall consider only the cost to the school.

TABLE 12. Distribution among first-cycle schools of average over-all cost per pupil, 1967/68

	Less than 450 DH	450 DH to 549 DH	550 DH to 599 DH	600 DH to 649 DH	650 DH to 699 DH	700 DH to 749 DH	750 DH to 799 DH	More than 800 DH
First cycle schools	1	—	2	3	3	1	1	1

Eliminating extreme figures, we find that for first-cycle schools the average cost is between 550 DH and 800 DH.

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[1] The salary cost (mainly teachers' salaries) varies according to a number of factors, i.e., pupil/teacher ratio, qualification, age and sex of teachers, and proportion of expatriates. See Section VI. (IIEP).

TABLE 13. Distribution among complete-cycle schools of average over-all cost per pupil, 1967/68

	500 DH to 599 DH	600 DH to 699 DH	700 DH to 799 DH	800 DH to 899 DH	900 DH to 999 DH	1 000 DH to 1 099 DH	1 100 DH to 1 199 DH	More than 1200 DH
Complete cycle schools	1	—	1	1	—	1	1	1

The cost series for the complete-cycle secondary schools do not contain enough figures to be really significant, but a very wide dispersion will be noted, since the higher costs are three times as high as the lower ones.

TABLE 14. Proportion of the components in the internal costs of schools (in percentage)

	Building	Equipment	Operation	Total
First cycle	2.0 %	0.5 %	97.5 %	100 %
Complete cycle	2.2 %	1.4 %	96.4 %	100 %

NOTE Bearing in mind the remarks previously made on the method of estimating building costs and annual rental charges, the proportion of the total cost attributable to buildings and equipment should be increased considerably (IIEP).

The share of the operating cost in the total per-pupil cost is very high (Table 14). The difference of about 1 per cent between first cycle and complete cycle schools is not significant considering all the estimates which were made with regard to salaries.

If we itemize the 'operation' component, we find that the share of salaries is very large (Table 15).

TABLE 15. Proportion of components in operating costs (in percentage)

	Salaries	Material	Total
First cycle	98.2 %	1.8 %	100 %
Complete cycle	98.5 %	1.5 %	100 %

It should be pointed out, however, that this distribution does not reflect the real expenditures made each year because, for the purposes of the study, it was necessary to exclude from the material component the purchases of durable (non-consumable) items which had been amortized elsewhere.

If we refer to the budget allotments made in 1968, we find the following distribution. Of the 195,792,000 DH allotted to secondary education to cover salaries and expenditures for materials, the expenditure for materials amounted to only 7,359,000 DH or 3.75 per cent, while the salary expenditure was 96.25 per cent, which is approximately 2 per cent less than the figures shown in the above table.

Whatever method of calculation is adopted, the conclusion is that the desire expressed in 1967 by the Moroccan Ministry of national education that the material component should represent 10 to 15 per cent of the operating cost cannot be fulfilled at the present time. Only a much greater proportion of native teachers in the next few years can make it possible to establish a balance more in accordance with the requirements.

To sum up, the following conclusions can be drawn:

1. The per-pupil cost in school is quite reasonable, but in some cases it is certainly inadequate for quality output.[1]
2. The administrative share of the cost is large, but not excessive.
3. The expenditure on operating materials is very much below what would seem to be necessary.
4. The very wide range of variation of the per-pupil cost in the complete-cycle secondary schools confirms the existence of privileged institutions in that category.

3. *Building costs*

Here again, a distinction must be made between first-cycle and complete-cycle schools because the latter usually have expensive specialized equipment for science instruction.

(a) First-cycle schools

Eliminating the two extremes, we have a range of variation, from 9.48 DH to 15.73 DH. This wide distribution can be explained by differences in the age of the schools, but the average cost of 13 DH is realistic, because it results in a per-classroom cost of 21,240 DH (average 11.91 DH for 36 pupils, over 50 years), which was within the utilization norms of the Equipment Division for 1967.

Building costs for administration

These vary from 0.5 DH to nearly 3 DH per pupil, according to the school, but do not depend, as might be thought, on the dimensions of the school. The median is situated at 1 DH, which is quite low. A shortage of administrative rooms in the design and construction of the school is usually to be found in schools built ten or more years ago. This shortage of administrative floor space has been remedied by converting classrooms into offices, which is a more expensive procedure and results in rooms not well adapted to their functions. An administrative section can now be constructed for a cost, calculated by the same method, of 0.90 DH per pupil.

Building costs for school rooms

The average cost of 11.9 DH is fairly representative of the whole. Eliminating the two extremes, the range of variation is from 8.55 DH to 15.77 DH, which reflects quite well the great differences in Moroccan buildings in general. Some secondary schools were installed in old primary-school buildings and even in former military barracks, while others had the benefit of recently constructed and functionally designed school premises.

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[1] It is difficult to interpret this statement without a definition of 'reasonable' and some discussion of how to measure quality of output and relate this to cost. (IIEP).

(b) Complete-cycle secondary schools

Building costs for administration
The average cost is slightly higher than for the first-cycle schools, being 1.32 as compared with 1.1 DH. This difference is not significant. The same remarks can be made here as for the first-cycle schools.

Building costs for school rooms
The imputed rent is decidedly higher than for the first cycle only: 19.01 DH as compared with 11.9 DH. The high cost of the science-teaching laboratories weighs heavily on the sample schools. Eliminating the extreme costs at both ends, the range of variation is as large as it is for the first-cycle schools (a variation of 100 per cent), from 10.76 DH to 23.40 DH per pupil per year. This difference is due, in this case also, to the great heterogeneity of the buildings.

(c) First-cycle and complete-cycle schools

Extra building costs for boarding schools
A clear distinction is established between the rental cost for a boarding pupil in a school giving the first cycle only and that in a complete-cycle school. While this cost ranges for first-cycle schools from 8.4 DH for those installed in former military barracks to 45.4 DH for recent buildings, the range is equally great for the complete-cycle schools, and varies from 30 DH to 115 DH.

4. *Furniture and school materials costs*

Both for furniture and for school materials, the costs in the complete-cycle secondary schools are higher than in the schools offering first cycle only, and this applies both to administrative rooms and to the premises used for instruction.

It should be noted that in the case of furniture the costs vary by as much as 100 per cent in each of these categories for the classrooms and by as much as 500 per cent for the administrative premises, and also that they are twice as high in the complete-cycle schools. The same remarks apply to the cost of school materials in the first-cycle schools.

In the case of complete-cycle schools, allowance must be made for those offering science, for which the school equipment and material costs are distributed in the following percentages:

Textbooks	31.5	
Science-teaching material	58.5	
natural sciences		27.0
physical sciences		29.0
chemical sciences		2.5

Drawing	0.5
History and geography	1.5
Modern languages	5.5
Audio-visual aids	2.0
Miscellaneous	0.5
	100.0

Boarding schools

This is the only series of costs in which the variation seems to be more normal. Eliminating the extreme upper limit (36.46 DH), the annual extra rental charge per boarding pupil varies from 20.33 to 30.45 DH. Considering geographical variations in prices, this indicates either greater standardization of boarding-school equipment, or else a generalized scarcity of equipment.

Summary

The entire set of tables shows that there are great differences between the different schools in buildings, furniture and school material and equipment.

This leads to the belief that while the standards recommended by the Equipment division of the Ministry of national education are applied at the beginning of a project, they are not respected later in the course of the successive extensions which are made under the pressure of increased numbers of pupils in the rush of each new school term.

IV. School building and equipment project financed with the assistance of IBRD

The preceding sections of this report reflect a situation which is the result of past decisions. In order to judge the realism of the Moroccan Educational Plan, it is necessary to look towards the future and to consider whether the existing equipment can be taken as a reference point for the forthcoming years.

At the time of writing a programme calling for the construction of twenty-one secondary schools is being carried out in Morocco with the financial assistance of the International Bank for Reconstruction and Development. An initial group of 450 general classrooms has been completed and the last group, which will include in addition science-teaching rooms and laboratories, administrative sections and boarding-school installations, is under construction. The costs of the two principal types of secondary school are known and will serve as a basis of study.

First case: Construction of a first-cycle secondary school

Rated capacity: 1,000 pupils
Components: 10 general classrooms
1 science section of 6 rooms
1 boarding-school section for 180 pupils
1 administrative section
1 workshop of 500 sq.m.

Owing to the elimination of technical instruction from the first-cycle schools, the workshop will be converted into eight general classrooms and auxiliary rooms.

A complete construction job of this kind required a commitment of 1,948,408.75 DH, but it is estimated that the final cost will be only about 1.8 million DH, as it has been found in the course of this study that for almost all the construction jobs carried out by the Ministry of national education the actual payments have been about 8 per cent lower than the amount of funds obligated.

The breakdown of this 1.8 million DH, which includes accessory expenditures, fees, etc., is as follows:

Construction cost		DH	DH
10 general classrooms (with corresponding sanitary facilities)		280 000	
Boarding-school accommodation (180 pupils)		842 000	
Administrative section and teacher facilities		200 000	
Science-teaching section		340 000	
Workshop		112 000	
Common areas and facilities		26 000	
			1 800 000
Equipment, furniture and materials (estimate)			
Administrative section		16 220	
Instructional premises:			
10 Classrooms	20 000		
Library	80 000		
Science section	227 500		
Recreational	50 000		
		377 500	
Boarding-school accommodation		239 900	
			633 620

To this bill must be added 80,000 DH for the conversion of the workshop into classrooms, and 16,000 DH for the furniture for these classrooms. Using the same method as in the preceding sections to determine the imputed rent, in order to enable comparisons to be made, we obtain:

Total construction cost: 1 880 000 DH
Administration: 69 000 DH
Imputed annual rent: 1 380 DH
Per pupil 1.38 DH

Tuition: 969 000 DH		
Imputed annual rent:	19 380 DH	
Per pupil:	19.38 DH	
Boarding: 842 000 DH		
Imputed annual rent:	16 840 DH	
Per pupil:	93.55 DH	on the basis of 180 boarding pupils. This can be reduced to 50 DH by the use of double-deck bunks.
Total equipment cost:	649 620 DH	
Administration: 16 220 DH		
Imputed annual rent:	1 200 DH	
Per pupil:	1.20 DH	
Tuition: 393 500 DH		
Imputed annual rent:	34 000 DH	
Per pupil:	34.00 DH	
Boarding 239 900 DH		
Imputed annual rent:	17 990 DH	
Per pupil:	99.94 DH	or 55 DH if double-deck bunks are used.

Second case: Construction of a complete-cycle secondary school

Rated capacity: 1,880 pupils
Components: 40 general classrooms
10 science classrooms
1 boarding-school section for 180 pupils
1 administrative section
1 pedagogical section (libraries)

The total amount of funds allocated for a construction of this kind at the present time is 2,788,422.95 DH. The actual amount paid should therefore not exceed 2.6 million DH, divided as follows:

Administration	75,000 DH
Educational premises	1,807,000 DH
Boarding-school facilities	718,000 DH

The imputed rent per pupil for this type of construction will then be:

Administration	0.80 DH	
Educational premises	19.22 DH	
Boarding-school facilities	79.77 DH	(or 45 DH by the use of two-deck bunks.)

The expenditure for furniture and school materials is estimated at 890,000 DH, divided as follows:

Administration	20,000 DH	
Instruction		
40 classrooms	80,000 DH	
Library, etc.	100,000 DH	
Science rooms	400,000 DH	
Recreation	50,000 DH	
Total for instruction purposes		630,000 DH
Boarding facilities		240,000 DH
Imputed annual rent per pupil		
Administration	0.8 DH	
Instruction	32.0 DH	
Boarding	128 DH	(or 65 DH with the use of two-deck bunks.)

For a serious comparison of costs, it would have been necessary to have information about variations in the price of construction of the schools covered by this study. In fact, the average costs are calculated on capital outlay over nearly 20 years.

On the other hand, as regards furniture and other school equipment, it should be borne in mind that with the exception of two or three of the schools which are the object of this study, the others are decidedly under-equipped with material, expecially for the teaching of science subjects.

TABLE 16. Building costs per pupil, average and IBRD Project (in DH)

	Administration	Instruction	Total	Boarding
First cycle				
Average costs	1.10	11.90	13.00	45.81
IBRD costs	1.38	19.38[1]	20.76	93.55 or 50.00[2]
Complete cycle				
Average costs	1.32	19.01	22.68[3]	45.81
IBRD costs	0.80	19.22	20.02	79.77 or 45.00[2]

[1] With science installations.
[2] With double-deck bunks.
[3] The difference between total costs and the sum of partial costs is due to the fact that the average for administration is calculated on a smaller number of schools.

It is to be observed in a general way that the annual imputed rent per pupil in the two schools now being completed under the IBRD Project (out of the programme of twenty-one) is no higher than that of the already existing schools. While the Ministry of national education did not have available a general index for building prices, it can at least be pointed out that, if it is considered that the average age of the schools covered by this inquiry is eight years (after eliminating the buildings dating from 1932, for which replacement costs were used), the index of wholesale prices for that eight-year period rose from 3,487 in January 1960 (on the index of 100 for 1939) to 4,630 as of December 1967. Under these conditions, it is certain that the schools now under construction will cost less per pupil than those constructed in the past.

Moreover, they form structural units which represent great progress in relation to many schools built by successive extensions, which has often resulted in heterogeneous complexes difficult to administer.

The furniture and school materials cannot be compared with those of the schools covered by this study, because most of the latter are only very sparsely equipped. It can be noted, however, that the equipment part which was included in the total annual cost of a complete-cycle secondary-school pupil will increase from 1.4 per cent to 3.1 per cent, which represents a great step forward because most of the increase in equipment will be for teaching purposes and, in particular, for the teaching of science.

The IBRD Project will also have other advantages which are more direct but not less important. There is a trend towards standardization of equipment, while heretofore standardization had only concerned buildings. For more than 10 years standard designs have been used for school rooms, but in the matter of equipment, and of teaching materials in particular, the inquiry in the 23 schools showed very great disparities between schools of the same type. The IBRD Project will offer the advantage of providing all the schools with adequate equipment from the outset without increasing the cost per pupil per year, since in these new schools, including operation, this cost will be 1,030 DH as compared with the present figure of 1,013 DH, an increase of only about 1.7 per cent.

V. Outlook for the future development of secondary education in Morocco

Targets

The current Educational Plan envisages an increase of about 76,500 pupils in secondary schools, including 5,400 boarding pupils. As nearly all of these 76,500 pupils will enter schools of the modern public type, it is possible to use the costs previously determined in order to check the realism of the Educational Plan.

Equipment

It is no longer appropriate to apply an annual imputed rent, but rather the cost of a new pupil-place for each category of equipment. Based on the costs found for the IBRD Project, each new pupil-place will cost as follows:

Administration:	from 40 DH to 69 DH
Instruction:	from 961 DH to 985 DH

Boarding: from 2,250 DH to 2,500 DH using double-deck bunks, or
from 3,988 DH to 4,677 DH using single bunks.

In order to allow for differences in the distance over which equipment must be transported, which causes considerable variation in the prices, it is logical to estimate the average cost of the two new schools being studied. In actual fact, one of them is located near a port, and the transportation cost will therefore be quite low; while the other is remote from any important commercial centre and is 200 miles from the coast.

The cost of a new pupil-place will be:

Administration:	50 DH	1,025 DH
Instruction:	975 DH	
Boarding:	2,400 DH with double-deck bunks.	

As regards the buildings, the 76,500 pupils will require a capital outlay of 78,412,500 DH for the administrative and instructional premises, while the boarding-school premises will require an additional investment of 12,960,000 DH.

The corresponding equipment in furniture and school material will cost:

Administration:	813,195 DH	= 26,448,354 DH
Instruction:	25,635,150 DH	
Boarding:	3,780,000 DH	

This gives a total of 121,600,845 DH for buildings and equipment. It must be noted, however. that the cost of the land is not included in this total and it is necessary to take into account the usual norms and the average price of the land. If we refer to an IBRD Project covering 13 schools for which the area and the cost of the land are known, we arrive at an area of 22 square metres per pupil at an average cost of 7 DH per sq. metre, making 154 DH per pupil. This represents a cost of 11,781,000 DH for the duration of the Plan.

The cost of the secondary education Plan would therefore be 133,381,845 DH, not including a necessary extra cost for the additional pupils in the technical sections.

The Five-year Plan for general secondary education provides for a total of 120,400,000 DH, plus an additional 6 million DH for technical education. The foreseeable deficit, not allowing for probable price increases, is therefore at least 13 million DH.

What is the cause of this anticipated deficit? Two factors seem to have coincided: First, under-evaluation of the costs; second, an under-estimate of the requirements for science-teaching equipment.

(a) Under-evaluation of costs

General classrooms

These were counted in the budget projections in the Plan at 25,000 DH each, but when the utilization programme for 1968 was established it was found necessary to re-evaluate the classrooms at 25,500 DH each. It appears that a new re-evaluation at 27,500 DH per classroom will be necessary for the budget year 1970. This leads to a deficit of about 3,600,000 DH for that item.

Land costs
This cost was estimated in the Plan at 4 million DH, but in the Education Project financed by IBRD it was found to be 154 DH per pupil, which would mean three times the anticipated amount. It should be taken into account, however, that the school premises constructed as extensions to existing schools will very often not require any further purchase of land. A deficit of about 4 million DH should be expected.

Boarding-school premises
This cost is estimated in the Plan at 23,520,000 DH, which would seem amply sufficient for the 5,400 pupil spaces distributed over 28 boarding-school installations of 180 to 360 spaces.

(b) Under-estimate of requirements for the teaching of science subjects

This is a large figure. The Plan provided for 180 science-teaching rooms in 30 different schools, but it will now be necessary, on order to obtain a normal balance in the educational programme, to provide a six-room science section per 1,800 pupils which, assuming a moderate rate of growth for the second cycle, would require 42 sections of six rooms each, in other words, a deficit of 5,544,000 DH for 12 additional science sections.

VI. Further analysis and commentary by IIEP

A. Analysis of current expenditures

As we have seen earlier, teacher salary costs constitute an important proportion of total costs (about 85 per cent using the method for estimating equipment costs previously adopted). The estimation of salary cost and its analysis in relation to explanatory variables is therefore an important aspect of the cost analysis.

The survey which has been used in the present case study can serve as a basis for estimating average salary cost school by school; the information thus obtained for each school can then be used to relate the average cost to explanatory variables. This is, in fact, an interesting contribution of the case study to cost analysis.

We felt therefore that a special section should be included in the report which analyses the behaviour of salary cost in relation to some explanatory variables. This section deals with three aspects of salary cost analysis: (i) collecting and estimating the statistical data; (ii) analysis of the results; (iii) cost behaviour in relation to explanatory variables.

1. *Collecting and estimating the statistical data*

The salary cost depends in principle on the pupil/teacher ratio, the qualification and the length of service of teachers, and the proportion of expatriates. On the basis of the statistical data obtained in the survey, these various items have been estimated, as shown in Table 17, using the following methods of estimation:

(a) Number of teachers

The number of teachers as obtained from the survey has been adjusted to take into consideration the extra hours worked. The conversion of these extra hours has been made on the basis of 20 extra hours per week (over the school year) being equal to one teacher. This estimate is based on the average teaching obligation for a teacher in the middle of the salary scale. This assumption is fairly approximate, but even an important error in the rate of conversion of hours to teachers would not lead to a serious distortion in the estimation of the total number of teachers.

(b) Proportion of expatriate teachers

This can be estimated in two ways: (i) by using only the normal obligation of teachers with no reference to extra hours taught; one can then obtain a ratio between the number of expatriate teachers and the total number of all teachers in which no account is taken of the extra hours worked; (ii) by taking into consideration all the hours worked; one should add, for expatriate teachers as well as Moroccan teachers, the total number of extra hours taught in each school.[1]

Unfortunately, no data were available to use the latter method of estimation; we have therefore estimated the proportion of expatriate teachers on the basis of the former method.[2]

(c) Pupil/teacher ratio

This has been estimated using the number of equivalent full-time teachers, including an allowance for extra hours taught.

(d) Average salary per teacher

The average salary has been computed by dividing for each school the total amount of salary paid (excluding allowances and payment for extra hours worked)

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[1] This number of extra hours taught includes the hours taught by teachers who do not belong to the school.

[2] As a matter of fact, the difference between the two approaches is not very important, since the extra hours taught constitute rarely more than 3 or 4 per cent of the total number of hours.

TABLE 17. Salary cost by school (in DH)

No. of school	No. of classes (1)	No. of teachers[1] (2)	Of whom expatriates (3)	Proportion of expatriate teachers[2] (4)	No. of pupils (5)	Pupil/ teacher ratio (5/2)	Pupils per class (5/1)	Teachers' average salary in DH	Unit cost per pupil in DH
First-cycle schools									
1	13	21	6	0.33	387	18.5	30	10 350	527
2	15	32	17	0.57	473	14.5	32	11 270	753
3	21	32.5			697	21.5	33	12 800	622
4	21	31.5	12	0.38	707	22.5	34	11 200	491
5	26	40	21	0.55	878	22	34	13 300	577
6	27	41	15	0.38	934	22.5	35	10 500	526
9	26	39.5	14	0.40	1 030	26	40	10 000	337
11	30	50	33	0.69	1 141	23	38	18 600	790
13	34	61	26	0.49	1 225	20	36	13 100	608
17	43	67.5	37	0.58	1 510	22.5	35	14 100	600
18	46	66	40	0.69	1 718	26	37	14 000	552
19	46	66			1 723	26	37	15 700	560
22	62	91.5	52	0.63	2 366	26	38	14 100	520
Complete-cycle schools									
7	31	56	36	0.64	1 009	18	33	18 900	1 051[3]
8	29	49	27	0.58	1 018	21	35	9 600	435
10	36	68	44	0.67	1 046	15.5	29	13 500	893
12	37	77.5	35	0.55	1 141	14.5	31	11 600	711
14	37	65.5	42	0.67	1 354	20.5	37	12 700	593
15	...	...	...	...	...	...	...	...	...
16	45	63	39	0.65	1 355	21.5	30	18 500	887
20	54	91	46	0.57	1 931	21	36	13 500	564
21	64	142	83	0.67	1 983	14	31	18 000	1 450
23	75	138	70	0.55	2 534	18.5	34	14 300	824[3]

1. Adjusted to take account of overtime.
2. Terms used in this table are defined in the text.
3. Estimated.

... Data not available.

by the relevant number of teachers. The average salary is therefore closely related to two variables: (i) the proportion of expatriate teachers, and (ii) the distribution of teachers by qualification and position on the salary scale.[1]

2. *Analysis of the results*

The following observations can be made from Table 17:

1. The proportion of expatriates is in general larger in the schools situated in large towns. This is very significant in the case of the first-cycle-only schools, as the complete-cycle schools are nearly all located in large towns and have generally a larger proportion of expatriates.
2. The pupil/teacher ratio is on average equivalent to 20.5 and there is little dispersion around this average except for a few cases (first-cycle school No.2 and complete-cycle schools Nos. 10, 12 and 21), which can all be explained by the existence of technical departments where the pupil/teacher ratios fall for obvious reasons to a level below the average (8 for example in the department of industrial technique in the complete-cycle school No. 21).
3. The average salary per teacher varies considerably from school to school; the ratio between the lower and the higher figure is 1:2. This is simple to explain: expatriate teachers with the same qualifications and number of years of service as their Moroccan counterparts receive a salary twice or three times as high as that of the Moroccan teachers. In addition, expatriate teachers usually have a greater number of years of service, and better qualifications, which leads to an even greater difference between the salaries of the expatriate and Moroccan teachers. Figure 1 shows the relationship between the average salary and the proportion of expatriate teachers in the sample schools. The relationship seems significant; the two schools which seem to constitute exceptions to the rule are located in the northern part of Morocco, where the majority of the expatriates come from Spain and therefore do not have the same status and advantages as the French teachers.

Another interesting point is the relation of the average salary to the distribution of teachers by qualification and number of years of service. As mentioned earlier, we do not possess enough data to make a thorough analysis, but it seems clear that the average salary is generally higher in the complete-cycle schools than in the first-cycle schools (due basically to the fact that the teachers are more highly qualified in the former), and also higher in urban schools than in rural schools (due basically to the fact that the older and better-qualified teachers tend to belong to urban schools).

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[1] It would have been much better actually to analyse the teacher cost in relation to the distribution of teachers by qualification and position on the salary scale—as was done in another case study in this project—but the data were not available for Morocco. This is why we had to use the average salary per teacher as a substitute for the distribution of teachers by qualification and salary.

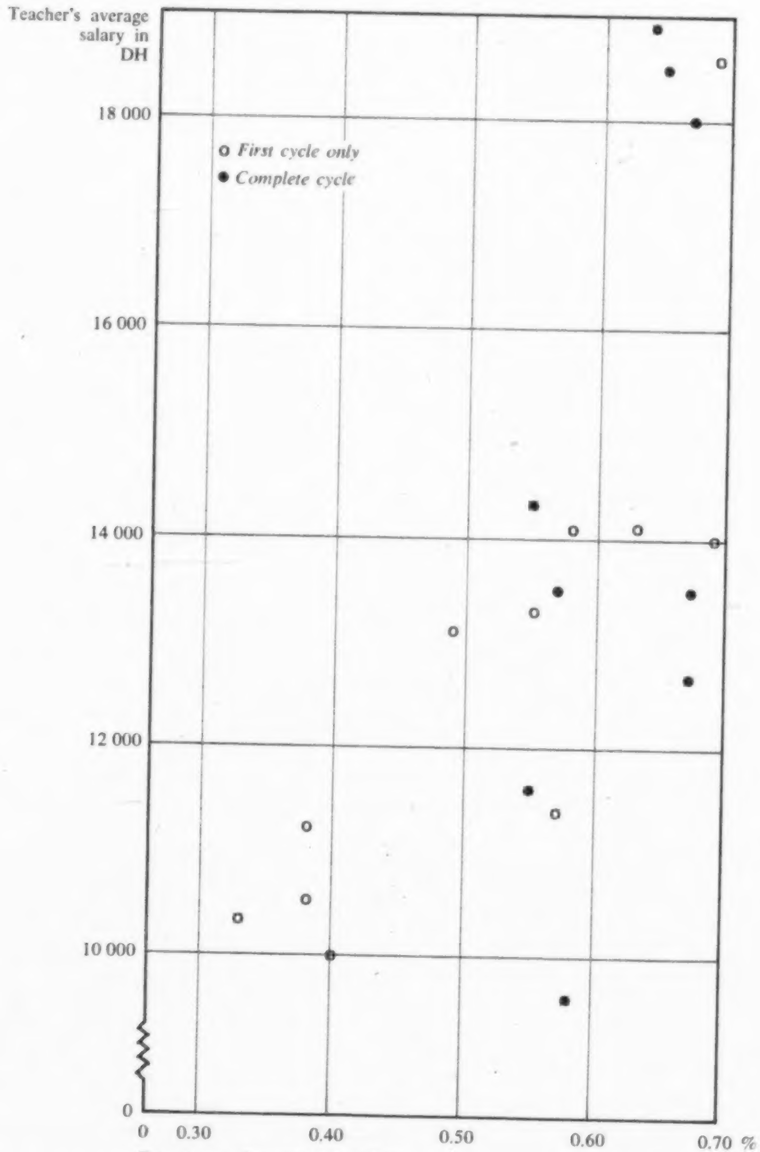

Figure 1. *Relationship between teacher's average salary and percentage of expatriate teachers.*

3. *Behaviour of salary costs*

The per-pupil salary cost varies from one school to another, the ratio between the extremes being 4:1. We have tried here to analyse statistically the relationship between per-pupil cost and a number of explanatory variables, by calculating a regression equation and correlation coefficients.

The variables are the following:

Per-pupil cost = Y
Explanatory variables:
teacher/pupil ratio = X_1
average salary per teacher = X_2
proportion of expatriates* = X_3

The estimates were made by using a system of weights related to the distribution of the enrolments school by school.[1]

The relations

Two relations have been used:

$$\text{(i) } Y = f(X_1, X_2)$$
$$\text{(ii) } Y = g(X_1, X_3)$$

Obviously, relation (i) would be more adequate than relation (ii). Yet we found it interesting to make two separate linear regression analyses. The formulae used are the following:

$$\text{(i) } Y = a_0 + a_1X_1 + a_2X_2$$
$$\text{(ii) } Y = b_0 + b_1X_1 + b_3X_3$$

The results

The following results were found:

$$\text{For relation (i) : } Y = 171.2X_1 + 58.5X_2 - 966.2$$

The total correlation coefficient is about 0.96. The standard estimated shows that the coefficients are significant.

$$\text{For relation (ii) : } Y = 184X_1 + 990X_3 - 806$$

The result is less satisfactory than the one found for the first relation, and the coefficient correlation is 0.85, which means that X_3 gives a less comprehensive explanation than X_2.[2]

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[1] In the case of the pupil/teacher ratio, using a weighted average, for which enrolments in each school serve as weights, gives the same results as when the average is worked out for all the schools taken together, as in the case of X_2 and X_3. However, there is a difference between a system of weights based on the enrolments and one based on the number of teachers in each school. There is here nothing fundamentally serious, but one should keep that in mind when interpreting the results and eventually using them for extrapolation.

[2] We should add, for the sake of accuracy, that these estimates have been made for all the sample using the data of all the schools except for schools Nos. 7 and 23, since these were not available when the regression analysis was made; yet we have tested these relations and as the following figures show, the result is quite satisfactory: for school No. 7, original cost 1,051; adjusted cost by relation (i), 1,124: for school No. 23, original cost 824; adjusted cost by relation (i), 803.5.

B. General commentary

As we have seen earlier, the main purpose of this study was to examine the behaviour of equipment costs in a sample of secondary schools in Morocco, using data collected for the purpose of preparing a loan request for IBRD. Certain other data on recurrent costs were also obtained and partially analysed. It would have been possible to make a more comprehensive analysis of unit costs if a few additional questions had been added to the original questionnaire.

Two sets of conclusions can be derived from the experience, one concerning the methodology and its possible application to other countries, the other concerning the actual results of the cost analysis itself.

It is a fairly common procedure to obtain cost estimates on the basis of budget data, but such estimates are at best rough averages that conceal important variations, and they may also omit significant cost elements. It is quite unusual—and this is probably one of the main interests of this study—to make cost estimates on the basis of an examination of the individual schools themselves.[1] However, from a methodological point of view, a number of difficulties have appeared.

The first concerns the method of sampling the schools. It was necessary to select schools for which comprehensive construction account files were available, and this had the effect of introducing a bias in favour of large urban schools as against rural and small schools.

Second, the method used for estimating the annual rental charge for buildings and equipment was simply to divide their total original cost by the number of years of their expected useful life. As we have seen in other case studies, an appropriate rate of amortization should be used, taking into account interest as well as depreciation. This makes a substantial difference; for example, if a 6 per cent per annum rate of interest had been allowed, the annual rental charge for buildings would have been more than three times the one calculated by the authors. The study actually calculates depreciation, rather than imputed rent.

Third, in the case of schools that had been built in successive stages over a number of years with several extensions added, the authors simply accumulated the original expenditure for each stage to estimate the total investment, rather than adding the separately-depreciated value of each part to obtain the value of the whole in current prices. Again, this obviously leads to an under-estimation of the real cost of the investments. An example showing the order of magnitude of the difference in the case of school No. 12. is given in the footnote on page 233.

Despite these methodological deficiencies, it is clear that the methods adopted by the authors offer several important advantages which repay the greater effort required for such an analysis of individual school accounts.

For one thing, the results obtained gave a much more accurate and detailed picture of the true situation than could have been derived from available documentation at the central administration. For example, it showed extra-budgetary contributions to school costs not included in central records, as well as significant variations among schools according to size and other characteristics.

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[1] Another study in this series—concerning Uganda secondary schools—also deals with the utilization of school accounts (page 67 of this volume).

Another advantage of the school-by-school examination was to reveal the true distribution of space utilization as between different functions (e.g. classrooms and administrative space), thus giving a more accurate basis for distributing capital costs by function. The picture thus obtained differed somewhat from that shown in the central records, for example because various conversions of classroom space to administrative use had occurred, either at the time of construction or later on, which were not revealed by the central records.

The chief value of the study under consideration, however, was incidental to its original main purpose of examining capital costs. The broader advantage of the approach used was to provide a clearer understanding of the composition of the over-all costs, both capital and recurrent, than could possibly have been obtained from aggregate central records. This approach makes it possible to get a fairly accurate picture of how much is spent per pupil for administration, for instruction, for social services, and the share of each of these represented by building and equipment costs, materials, teachers' salaries, and other specific expenditure items.

The 'individual school accounts' approach can therefore be strongly recommended to other countries as a means of getting a more accurate and useful picture of true costs, broken down by components, distributed by function and purpose, and showing significant variations among schools of different sizes and types. A note of caution must be sounded, however, with respect to the sample of schools used. If valid generalizations are to be drawn for the school system as a whole, the sample must be fairly representative of urban and rural schools, and different sizes and categories of schools, and sufficiently large for each category to be adequately represented. Another cautionary note is that an inquiry conducted in the schools requires a staff of investigators who are fully cognizant of the targets of the study, who have full freedom of access to the facts, and who have a good knowledge of the management methods used in school administration.

With respect to the practical results flowing from the study we have examined, readers are reminded that this inquiry was undertaken in connexion with research requested by the Committee on Human Resources of the Moroccan Planning Commission. One might reasonably expect, therefore, that its effects may be felt in various future governmental decisions concerning secondary education in Morocco.

For instance, the findings of this study may have an effect on the school location map, since it demonstrated that schools for 2,500 pupils are not necessarily more economical than schools for 1,500 to 1,800 pupils and that the larger schools are more difficult to administer.

The findings may also provide additional arguments for the Ministry of national education in seeking more favourable budget allotments for secondary education in order to achieve the quantitative targets of the Plan.

Third, these findings may lead to greater standardization of school buildings and equipment, as it becomes evident that the facilities resulting from the IBRD

Project yield functionally better results at no significantly higher cost than previous ones built on a more individualized basis.

Finally, the benefits deriving from this initial inquiry may encourage the Ministry to make further similar inquiries at other levels of education and training and to extend the present study to the entire field of secondary education. In this connexion it is encouraging to note that a 'classification file' project for every secondary school is already under consideration and that initial investigation has shown that the establishment of such a classification system is both desirable and feasible.

It is true, of course, that an 'individual school accounts' approach to cost analysis entails a much larger and more meticulous effort than the more familiar method of working solely from aggregate accounts in the central administration, particularly if uniform records have never been kept by individual schools. But it is also true, and this is the most important conclusion we draw from this study, that no educational system can truly know its costs without detailed accounts of this sort. The cost and effort of establishing and maintaining such a system of uniform accounts, we believe, would pay for itself many times over by revealing opportunities of many sorts for getting better educational results from available resources.

Appendix

Table 1. School enrolment in Morocco by level of education

Level	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68
Primary	950 390	1 017 260	1 080 029	1 096 798	1 115 745	1 080 072	1 115 672
Secondary	96 242	113 636	139 758	172 483	210 931	241 730	267 631
Higher	4 767	4 990	5 456	8 441	8 996	7 734	7 986
Total	1 151 399	1 135 886	1 225 243	1 277 722	1 335 672	1 329 536	1 391 289

Table 2. Output of the school system: enrolment in the last grade of primary schools and in the first year of secondary school ('orientation class')

	1963/64	1964/65	1965/66	1966/67	1967/68
Enrolled in last grade primary	184 369	190 750	197 848	198 064	205 262
of which:					
admitted to secondary	40 477	55 956	57 067	57 424	50 600[1]
repeating last grade primary	80 303	84 736	90 338	93 755	103 000[1]
dropping out at end of primary	63 589	50 058	50 443	46 885	51 400[1]
Enrolled in first class of secondary	16 792	40 477	59 032	64 904	67 137
of which:					
admitted to second class	...	35 109	47 141	50 318	...
repeating first class of secondary	...	3 076	7 837	9 713	...
drop-outs	...	2 292	4 054	4 873	...

[1] Estimated.

... Data not available

Table 3. Enrolment in final grades of secondary education and results of final examinations

	1963/64	1964/65	1965/66	1966/67	1967/68
Numbers completing first cycle	...	...	...	...	36 526
Examined	25 385	32 254	35 487	33 271	35 490
Passed examinations	12 397	13 091	12 316	12 757	11 657
Numbers completing second cycle	...	...	...	...	8 934
Examined[1]	5 673	6 976	8 714	9 104	10 153
Passed examinations	2 953	2 980	2 719	3 384	3 820

[1] Including candidates who had already left school.

... Data not available

Table 4. Teachers in public primary schools, by nationality and qualifications

	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68
Moroccan	19 853	22 405	25 045	26 017	27 490	29 138
Foreign	2 400	2 430	1 619	1 039	492	91
Total	22 253	24 835	26 664	27 056	27 982	29 229
Percentage of native Moroccans	89	90	93	96	98.3	99.7
Teachers holding degrees	1 606	5 910	6 566	6 747	8 117	9 299
Teachers still in training and substitutes	11 456	7 129	9 718	7 355	14 698	15 295
Monitors	9 191	11 796	10 380	12 956	5 167	4 544
Percentage holding degrees	7.2	24	24	25	29	31

NOTE Private schools in Morocco had approximately 1.270 teachers in 1967/68, of whom 27 were foreigners.

Table 5. Teachers in public secondary schools

(a) By nationality

Year	Moroccans		Foreigners		Total
	Number	%	Number	%	
1962/63	1 151	26	3 218	74	4 369
1964/65	3 153	41	4 404	59	7 557
1966/67	6 102	50	6 028	50	12 130
1967/68	8 281	59	5 986	41	14 267

(b) By qualifications

Year	University graduates		Secondary school + 2 years		Secondary school graduates		Others	
	Number	%	Number	%	Number	%	Number	%
1964/65	1 440	19	644	8.5	2 958	39	2 515	33
1967/68	...		...		...		1 583	...

... Data not available

TABLE 6. Recapitulation of per-pupil costs in the schools covered by the inquiry (in DH)

(a) *Full data*

School No.	Building costs (1)	Equipment costs (2)	Total (1+2) (3)	Operational costs (4)	General total (3+4) (5)
1	10.80	5.72	16.52	673.54	690.06
2	38.83	4.68	43.51	947.06	990.57
3	14.47	4.82	19.29	714.28	733.57
4	15.51	4.46	19.97	567.21	587.18
5	7.94	4.81	12.75	652.93	665.68
6	11.34	3.12	14.46	603.42	617.88
7[1]	10.60	14.54	24.14	...	...
8[2]	21.04	5.19	26.23	542.56	568.79
9	13.18	3.31	16.49	430.05	446.54
10[1]	21.35	14.24	35.59	1 054.38	1 089.97
11	15.73	4.43	20.16	...	...
12[1]	12.17	5.98	21.57	811.08	832.65
13	13.43	3.32	16.75	670.68	687.43
14[1]	24.58	13.30	37.88	724.22	762.10
15[2]	22.85	20.14[3]	43.03	...	...
16[1]	38.45	15.09	53.54	1 096.70	1 150.24
17	17.07	5.14	22.21	745.26	767.47
18	9.49	3.79	13.28	610.22	623.50
19	9.48	2.57	12.05	620.75	632.80
20[2]	11.36	...	15.67[3]	672.10	687.77
21[1]	33.97	20.14	54.11	1 696.70	1 750.81
22	10.57	2.63	13.20	580.30	593.50
23[2]	...	...	...	...	...

1. Complete-cycle secondary school with science section in the second cycle.
2. Complete-cycle secondary school.
3. Estimate.

... Data not available

(b) *Cost increases by steps of 50 DH*

Range	Number of schools	Range	Number of schools
400–449	1	750–799	2
450–499	—	800–849	1
500–549	—	850–899	—
550–599	3	900–949	—
600–649	3	950–999	1
650–699	4	1 000–1 099	1
700–749	1	1 100 and over	2

The median is 687.77 DH, the typical school is in the 650–699 group, and the weighted average is established as follows:

For a first-cycle secondary school	649 DH
For a complete-cycle secondary school	1 025 DH
For both types of secondary school	725 DH

TABLE 7. Recapitulation of per-pupil costs for boarding schools (in DH), in increasing series

Investment Cost	31.64	70.48	44.87	68.31	78.13
Operating Cost	793.00	873.00	1 132.00	1 110.00	1 144.00
Total	824.64	943.48	1 176.87	1 178.31	1 122.13
No. of school	6	4	1	18	10

The average costs cannot be determined with so small a sample, but by considering the average costs of the components we obtain:

Capital rental costs	63.24 DH
Operating cost	1 369.38 DH
Average over-all cost	1 432.62 DH

TABLE 8. School materials and salaries for administration and tuition; operating costs in increasing series (in DH)

School No.	Materials cost		Salaries cost		Total cost	
	First cycle	Complete cycle	First cycle	Complete cycle	First cycle	Complete cycle
9	14.05		416.00		430.05	
8		5.56		537.00		542.56
4	12.21		555.00		567.21	
22	10.30		570.00		580.30	
6	8.42		595.00		603.42	
18	9.22		601.00		610.22	
19	8.75		612.00		620.75	
5	13.93		639.00		652.93	
13	17.68		653.00		670.68	
20		13.10		659.00		672.10
1	22.54		651.00		673.54	
3	11.28		703.00		714.28	
14		18.22		706.00		724.22
17	5.26		740.00		745.26	
12		19.08		792.00		811.08
2	21.06		926.00		947.06	
10		32.38		1 022.00		1 054.38
16		15.70 [1]		1 081.00		1 096.70
21		11.26		1 623.00		1 634.26
Average costs	11.45	15.70	621.08	961.02	632.53	976.72

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[1] Estimated.

TABLE 9. Operating costs, material and salaries (in DH) for boarding schools, in increasing series

Cost	793	813	873	*988*	1 053	1 110	1 132	*1 144*	*1 679*	*1 708*
School No.	6	5	4	*8*	9	18	1	*10*	*14*	*21*

Figures in *italic* are for complete-cycle secondary schools. Weighted average operating costs are as follows:

First cycle	983.59 DH
Complete cycle	1 427.20 DH
Both types	1 369.38 DH

TABLE 10. Recapitulation of investment costs (in DH): administration plus instruction costs, in increasing series

Costs			Costs		
First cycle	Complete cycle	School No.	First cycle	Complete cycle	School No.
12.05		19	20.16		11
12.75		5		21.57	12
13.20		22	22.21		17
13.28		18		24.14	7
14.46		6		26.25	8
	15.67	20		35.59	10
16.49		9		37.78	14
16.52		1		43.03	15
16.75		13	43.51		2
19.29		3		53.54	16
19.97		4		54.11	21

NOTE Building costs equal annual imputed rent per pupil for a life of 50 years. Equipment costs equal annual imputed rent per pupil for a life of 20 years for furniture and 10 years for school materials.

TABLE 11. Investments costs for boarding schools—recapitulation: cost of investment, furniture and material equipment (in DH)

Cost	31.64	44.87	68.31	70.48	78.13	81.15
School No.	6[1]	1[1]	18[1]	4[1]	10[2]	7[2]
No. of boarding pupils	80	120	69	157	346	308

Average cost for first cycle:	46.94 DH
Average cost for full cycle:	79.55 DH
Average cost both types:	63.24 DH

[1] First cycle.
[2] Complete cycle.

TABLE 12. Equipment (furniture and material) for administration and tuition; costs in increasing series (in DH)

School No.	Furniture costs		Material costs		Total costs	
	First cycle	Complete cycle	First cycle	Complete cycle	First cycle	Complete cycle
19	1.63		0.94		2.57	
22	1.68		0.95		2.63	
6	2.56		0.56		3.12	
9	2.22		1.09		3.31	
18	2.25		1.07		3.32	
13	2.23		1.56		3.79	
11	1.99		2.44		4.43	
4	3.12		1.34		4.46	
2	4.00		0.68		4.68	
5	2.88		1.93		4.81	
3	2.91		1.91		4.82	
17	3.36		1.78		5.14	
8		3.62		.57		5.19
1	2.90		2.82	1	5.72	
12		3.42		2.56[1]		5.98
14		2.86		10.44[1]		13.30
10		3.66		10.58[1]		14.24
7		3.82		10.72[1]		14.54
16		4.35		10.74[1]		15.09
21		5.85		14.29[1]		20.14
Weighted average					3.75	14.42[2]

[1] Estimate.

[2] Taking into account the estimates made and allowing for the inclusion in the series of School No. 15, a high quality complete cycle school, at the same cost as School No. 21.

TABLE 13. Furniture costs in increasing series for administration plus instruction (in DH)

School No.	First cycle	Complete cycle	School No.	First cycle	Complete cycle
19	1.63		1	2.90	
22	1.68		3	2.91	
11	1.99		4	3.12	
9	2.22		17	3.36	
18	2.23		12		3.42
13	2.25		8		3.62
20		2.31	10		3.66
6	2.56		7		3.82
23		2.83	2	4.00	
14		2.86	16		4.35
5	2.88		21		5.85
Medians				2.56	3.62

Chile 25

Improving efficiency in the utilization of teachers in technical education

prepared by Lucila Arrigazzi *and* José de Simone

The authors of this case study, Miss Lucila Arrigazzi, an IIEP staff member, and Mr. José de Simone, a Unesco expert in Chile, have taken advantage of comments made by several experts and consultants including Mr. John Chesswas and Miss Maureen Woodhall. Mr. Pacheco Barrios assisted in the collection of data. Mr. P.H. Coombs and Mr. Jacques Hallak served as principal advisers to the study. The Institute gratefully acknowledges the helpful co-operation of the Government of Chile in providing the basic data for the study.

Introduction

In February 1968 the Chilean educational authorities decided that owing to severe financial constraints the 1968 budget for the four branches of Chilean public technical education would have to remain at the same level as in 1967. This meant that the expected large increase in enrolments would have to be catered for within the same number of teacher-hours. It was estimated that only about 70 per cent of the planned expansion would be feasible with the resources available. Under such circumstances, it was obvious that an attempt had to be made to achieve a better utilization of teacher resources if the desired expansion was to be achieved. In spite of the simplicity of the exercise, substantial results were obtained. This study is concerned successively with background information, the study of teacher utilization, the set of measures undertaken and their results.

Secondary technical education comprises industrial, agricultural, commercial and 'specialized'[1] technical schools. Up to 1965 secondary courses started after six years of primary education and lasted five years (see Figure 1). One-, two- and three-year specialization courses were also provided for those completing the five-year course. The curriculum included both general and technical subjects from the first form, although the latter increased their share of the timetable as the course progressed. In the first form already far more than half of the technical courses were devoted to workshop activities, except in commercial schools which had little practical content in the lower forms. As a result of the 1965 educational reform secondary technical education now starts at a later stage, after eight years of general basic education, and lasts for four years. The reform also brought changes to the technical education curriculum. The first form of industrial and specialized schools and the first and second forms of commercial schools now provide a common curriculum for all specialities within the branch: only after this stage are students separated according to specialities. The changes resulting from this reform were gradually introduced as from 1966. During 1966 and 1967 the old first and second forms of secondary technical and general schools were 'replaced' by the seventh and eighth grades of basic education, run in primary schools or 'basic centre' schools.

In 1968 the reform affected technical and general secondary schools with the creation of the first form of the new four-year course intended for the first generation of students with eight years' basic education (see Figure 2). In 1967 51,348 students were enrolled in technical schools, representing 27.6 per cent of total enrolments in secondary education;[2] of these 38,210 were in 115 state technical schools.[3]

In January 1968 the Ministry of education's Planning office organized meetings

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[1] Servicios y Técnicas Especializadas (catering, textiles, tailoring, health, etc.).

[2] Forms 3 and higher.

[3] In addition, 2,138 were enrolled in technical courses in state 'comprehensive' schools under basic education authorities, and 10,999 in private technical schools.

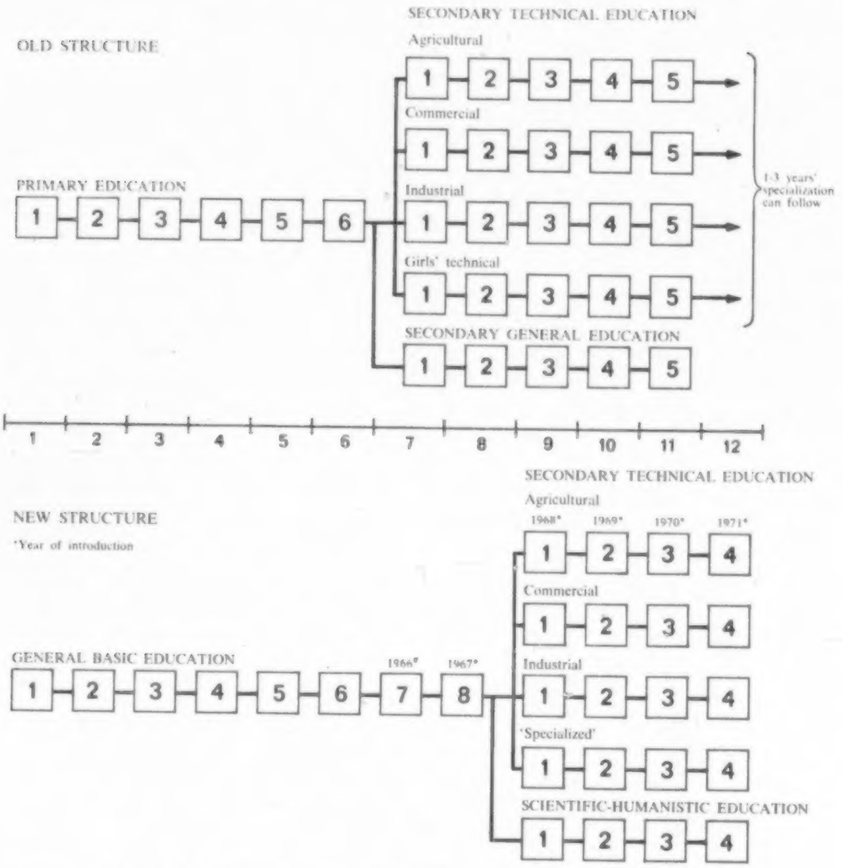
OLD STRUCTURE
SECONDARY TECHNICAL EDUCATION
Agricultural
Commercial
Industrial
Girls' technical
1-3 years' specialization can follow
PRIMARY EDUCATION
SECONDARY GENERAL EDUCATION
1 2 3 4 5 6 7 8 9 10 11 12
NEW STRUCTURE
*Year of introduction
SECONDARY TECHNICAL EDUCATION
Agricultural
1968* 1969* 1970* 1971*
Commercial
Industrial
'Specialized'
GENERAL BASIC EDUCATION
1966* 1967*
SCIENTIFIC-HUMANISTIC EDUCATION

FIGURE 1. *Educational structures, pre- and post-1968*

with headmasters of all general and technical secondary schools to make arrangements concerning the number of classes which would have to be provided by each school in 1968 in order to absorb the anticipated enrolments.[1] In industrial, commercial and specialized technical schools, which are those to be covered by this study, the 'old' third forms were to be transformed into the new form 1 (see Figure 2). The number of such classes would have to increase considerably,

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[1] The number of candidates for entry in the first form of secondary education in 1968 was estimated by assuming that all students who had sat for the final basic education examination —the requirement for secondary education entry—would apply for entry. This assumption seemed justified in view of the strong social demand for secondary education; between 80 per cent and 85 per cent of students enrolled in the eighth grade sit for such exams. This coefficient was applied to each local area.

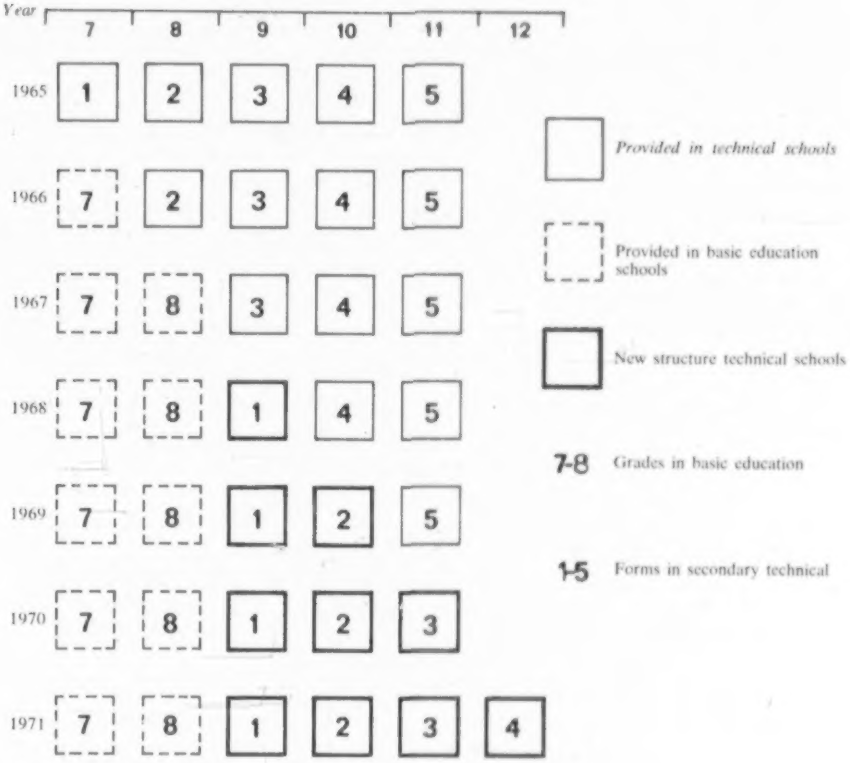
Year
7
8
9
10
11
12
1965
1966
1967
1968
1969
1970
1971
1
2
3
4
5
7
8
Provided in technical schools
Provided in basic education schools
New structure technical schools
7-8 Grades in basic education
1-5 Forms in secondary technical

FIGURE 2. *Technical schools: change-over from old to new schedule.*

from 468 in 1967 to 596 in 1968. Classes in other forms were planned to increase from 750 to 815. The number of classes to be provided by each school in a given area was determined, taking account of the number of classrooms and workshops available in each school. It was thought at the time that the number of teacher-hours would need to be increased as compared with 1967, so as to cope with the increase in classes.

Various factors seem to have led the authorities to decide that the financial resources for technical schools in the current year should not exceed those of 1967, despite the demands for expansion agreed upon at the headmasters' meetings. First, the state educational system had seen its enrolments increase very rapidly in previous years, partly as a result of government policy for expanding the proportion of children completing eight-year basic education. For example, in 1965 enrolments in state primary schools and in the first and second secondary forms increased by about 16 per cent compared with 1964, and the rest of the secondary courses by about 8 per cent. In 1966 and 1967 enrolments in seventh and eighth grades of basic education[1] had grown by as much as 41 per cent and 24 per cent respectively,[2] and secondary enrolments by about 12 per cent and 15 per cent (see Appendix, Table 1).

Secondly, the pressure of numbers brought about a considerable increase in expenditure on education, particularly in 1967, although other factors may also have contributed to such increase. In 1967 total public expenditure on education accounted for 18.5 per cent of total public expenditure and 4.5 per cent of GDP, as compared with 14.5 per cent and 3.98 per cent respectively in 1966 (see Appendix, Table 2). The education sector was competing for scarce government financial resources with other social sectors, such as health, welfare and housing. Some of the authorities concerned held the opinion that the educational sector might be relatively over-expanded. Finally, the Ministry of education was aware of the fact that as a result of the abolition of the first and second forms of technical education during 1966 and 1967 technical schools might have some surplus teacher-hours which could not be re-allocated, and that the reduction in student numbers which had resulted from the reform had not been matched by a corresponding reduction in expenditure.[3] The educational authorities therefore decided to freeze the technical education budget for 1968, recognizing that improving efficiency in the use of teacher resources might be a good way of solving the problem posed by the expansion of technical education enrolments.

The Technical secretariat for Technical education (hereafter called the Secretariat)—an advisory unit under the Directorate-general for technical education carrying out studies to be used as a basis for policy decisions—was asked to give advice on the subject. The Secretariat decided to undertake a survey to assess whether it was possible to expand enrolments up to the level set at the headmasters' meetings with the same teacher resources as in 1967. But, before proceeding with the review, there is a point here which deserves attention.

Why were the financial constraints concerning the development of technical education discovered such a short while before the beginning of the school year? On the one hand it should be noticed that, although Chilean educational authorities were near to introducing programme budgeting, in 1968 the educational budget was still being prepared on a year-to-year basis and, unfortunately, the annual budget is not always approved in time for adequate planning decisions. On the other hand it seems probable that the problem was discovered at such a late stage partly as a result of a weak *ex-ante* costing of the educational expansion programme being carried out by the government. The Chilean experience clearly illustrates the need for carrying out *ex-ante* studies anticipating the financial implications of educational programmes and reforms, in order to test their feasibility and anticipate constraints; in the present case, such a study would probably have allowed the authorities to foresee long in advance both the financial constraints and the need to improve the use of school resources.

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[1] Corresponding to the old first and second secondary forms.

[2] The educational reform established the system of automatic promotion in the first three grades of primary schools (the effect of this reform was not yet felt in 1966 and 1967) and expanded the provision of financial assistance to pupils and school meal services.

[3] In 1966 recurrent expenditure in state industrial, commercial and specialized technical *day* schools—57,230,100 escudos (current prices)—accounted for 6 per cent of total public expenditure in education. In 1967 it still accounted for 4.5 per cent, in spite of the fact that the number of students had dropped (as a result of the abolition of the old first and second forms) from 66,090 to 36,443 (or from 4.5 per cent to 2.5 per cent of total enrolments in state schools). (See Table 4 in text and Appendix, Tables 1 and 2.) The rate of exchange at the time of this study was 7.80 escudos = U.S. $1.00.

II. The school survey

The Secretariat aimed at designing a set of measures which would absorb the 1968 enrolments without an increase in the number of teacher-hours. [illegible] first step was to obtain information on existing utilization of teachers. Since the information available either through current school statistics or at the Department of personnel of the Directorate of technical education (dealing with teachers' appointments and payment) was not detailed enough to allow for a full analysis of the situation, they decided to carry out a *survey* by means of questionnaires sent to headmasters, of the 100 industrial, commercial and specialized state technical schools.[1]

To understand fully the meaning of the questionnaire, some background information is required. First, it should be noted that in Chile teacher appointments are made on the basis of hours to be taught. Secondly, the implementation of the educational reform had caused some administrative problems concerning the appointment and redistribution of teachers. During 1966 and 1967 technical schools had to transfer to the newly created seventh and eighth grades of general basic education—most of them run in primary schools and 'basic centres'—those teachers who were previously teaching general subjects in the 'old' first and second technical forms. Moreover, as a result of the reform, some technical subjects were dropped or their number of curriculum hours reduced, thereby leaving the corresponding staff idle.[2] The educational authorities decided that, as an interim measure, those teachers with 'idle' hours would attend training courses or perform other school duties, such as preparing audio-visual aids and other teaching materials, assisting teachers in workshop classes and participating in the provision of school services such as school libraries. It was felt at the time that the educational reform might have left a significant number of teacher-hours not being used for teaching purposes, although the magnitudes involved were not known.

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[1] A similar survey (not reported in this study) was made in connexion with agricultural schools.

[2] By 1967 this had already affected those teachers who were teaching technical subjects in the old first and second forms, and would affect teachers in other forms from 1968 onwards (see Figure 2).

Moreover, it was thought that teachers were perhaps under-utilized even before the introduction of the reform, as a result of current shortcomings in the system of teacher appointment. If this was in fact true, the reform would have served to aggravate the situation. The Secretariat therefore considered that the existing distribution of teachers needed to be thoroughly reviewed and that consequently precise information had to be collected on this subject.

The questionnaire aimed at finding out (i) how much of the time during which teachers were employed was not being used for teaching purposes, and (ii) whether it would be possible to increase the number of pupils per class. The survey produced two main findings. First, as shown in Table 1, as much as 13.7 per cent of total teacher-hours were in fact being devoted to tasks other than teaching, or were idle. Secondly, although the *average* number of students per course observed in 1967 (29.9) could be considered reasonable, in many cases the size of courses was too small, particularly in specialized and industrial courses. This is shown in Table 2.

TABLE 1. Teacher-hours and size of classes: industrial, commercial and specialized schools, 1967

Items	Number
Enrolments (forms 3 to 8)	36 443
Classes	1 218
Students per class	29.9
Teacher-hours in the appointment[1] (per week) of which:	53 781
Teacher-hours utilized (per week)	46 426

[1] Teacher-hours *in the appointment* refer to the number of teaching-hours for which teachers were appointed and paid, as distinguished from teacher-hours utilized or taught.

SOURCE Ministry of Education, Directorate for technical education.

TABLE 2. Distribution of students by classes, 1967[1]

Number of students per class	Commercial		Industrial		Specialized	
	No. of classes	%	No. of classes	%	No. of classes	%
Up to 4	1	0.2	14	3.9	59	28.4
5 to 9	15	2.4	48	13.4	90	43.2
10 to 39	605	97.4	296	82.7	59	28.4
40 and more	—	—	—	—	—	—
Total	621	100.0	358	100.0	208	100.0

[1] Information is available for 1,187 out of 1,218 existing classes.

SOURCE Directorate for technical education.

There were two reasons for this state of affairs directly connected with the implementation of the educational reform:

1. In 1967, teachers in general curriculum subjects (i.e. history, Spanish, etc.) in what were the 'old' first and second forms who were not needed in technical schools had been automatically transferred to general schools in the area. In

many cases, the new school required and used fewer additional teacher-hours than had been attributed, leaving some teacher-hours idle. Many of the transferred teachers continued to be administratively dependent on their previous technical school, on whose payroll they still remained. The headmasters of the general schools were not necessarily informed of the number of teacher-hours that a certain newly-transferred teacher should teach at their schools. Since there was no communication between general and technical schools about the deployment of the staff transferred, all teachers had received their full salaries during 1967, whether the complete number of teacher-hours had been taught or not. At the same time, the school principals were not aware of the situation—and still less the Ministry of education.

2. Some of the teachers teaching *technical* subjects in the old first and second forms had seen their specialities dropped or their number of hours reduced during 1966 and 1967, while the number of vacant posts available in other forms at their own schools were not enough to absorb the excess hours or did not correspond to the specialities of the teachers concerned. During the summer of 1968 some teachers had been retrained so as to enable them to teach new specialities; the rest had been allocated to other school duties as mentioned above. It was not possible at this stage to assess the success of such measures. However, as has already been mentioned, teachers were in general reluctant to perform duties for which they had not been appointed or which they considered to fall below the status of a teacher.

In addition, some other information was brought to light which should be attributed to factors *other* than the reform itself. Although information on previous years was not available, it was felt that under-utilization of teachers, particularly as regards small-size classes, was no new problem in technical schools. For example, the small size of classes observed in some schools, although partly an indirect result of the teacher surplus brought about by the reform, was due to a decrease in the students' demand for certain specialities which had not been matched by a compensatory reduction in the number of teachers and classes. In a few extreme cases workshop teachers had been left completely idle because no student wished to enrol for their particular specialization, although these subjects were still included in the curriculum.

In consequence, it was recognized that the existing system for appointing teachers in Chile was equally as responsible for current shortcomings in teacher utilization as the educational reform. The educational administration in Chile is strongly centralized, and teachers are appointed by the central authorities. Headmasters are responsible for informing the central authorities of the vacant hours to be filled or, conversely, of the additional teacher-hours needed. There are teachers with permanent appointments *(propietarios)*, which are competitive posts, and teachers with fixed-term contracts *(interinos)* who are directly nominated by the Ministry of education, after either the headmaster of the Ministry itself has put forward a suitable candidate. Both types of teacher can be appointed for any number of teaching-hours up to a maximum of 36 hours per week. There is also a division into first and second category teachers, according to qualifications.

Until 1968 there were no explicit norms for the appointment of teachers, such as, for example, the number of students per class. Headmasters had to justify in some way their demands for new teacher posts, though not those for teachers to fill existing vacant posts. Moreover, the information available to the central administration on each school was not enough to make detailed analysis on the use of teachers' time possible. For example, the school statistical reports provide information on enrolments per form and speciality, but only for the total number of classes for the whole school.[1] As far as information available is concerned, there is the particular case of vacant teacher posts. The survey found that there were two types of surplus teacher-hours: those corresponding to vacant teacher posts temporarily unfilled,[2] and the free hours of employed teachers (hereafter called 'untaught' teacher-hours). If a teaching post was left vacant because of death or retirement the corresponding teacher-hours were, until 1968, the 'property' of the school and speciality concerned. If a given school did not need to fill the vacancy immediately, the central administration was not necessarily informed of such vacancy. The survey revealed that this had actually happened in some cases.

Finally, school supervision is inadequate, with too many schools and teachers per inspector. In 1967 there were five inspectors for 115 technical schools distributed all over the country.

This brief review of the situation in Chile shows that the main shortcoming in this case was insufficient anticipation of the measures required by the educational reform in order to ensure the best possible re-allocation of personnel. It is true that even if all the consequences of the reform had been carefully considered in a serious *ex-ante* study, some resources would still have remained 'idle' for some time, if only because the reform was established by law at the end of 1965 and immediately introduced in 1966. However, the amount of resources underutilized might have been considerably smaller. For example, the measures for improving teacher utilization could have been started earlier, and teachers' appointments restricted after 1966. Teachers could probably have been retrained in greater numbers. Finally, we cannot assess at this stage whether the use of idle teacher-hours for non-teaching purposes, which was mentioned above, made any significant contribution to the functioning of schools; in any case, this could only be so if suitably prepared and implemented.

At the same time, the factors existing before the implementation of the educational reform should not be ignored; for example, the current practices of teacher appointment. Two main problems can be mentioned: (a) a certain lack of efficiency criteria in the appointment of teachers, both on the side of the central administrative units and of the headmasters; (b) a centralized administration can only function where there is a good system of communication between the central administration and schools, and an efficient supervisory system. This was not the case in Chile. This meant that, on the one side, the educational authorities had little information on the use made of teacher resources in schools, as well as little control over it. On the other side, headmasters appear to have been mostly concerned with their own schools rather than being involved in the functioning of the system as a whole. It is not surprising that headmasters are principally concerned with obtaining the most resources possible—whether teachers or otherwise. Their reasoning is frequently based on an anticipation of future shortages or an argument for better quality—for example, 'the lower the pupil/teacher ratio, the higher the quality'.

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[1] At the time the survey was to be administered it was difficult to obtain at the Ministry of education central headquarters complete data on the total number of teachers and teacher-hours being paid. The relevant information was rather dispersed, and to assemble it would have required in itself a special survey.

[2] The existence of unfilled vacancies is, in many countries, evidence of a shortage of teachers, rather than a surplus. This is not the case here since there were sufficient unemployed teachers to fill the vacancies if desired, and they were temporarily unfilled because of excess teacher capacity.

We are not concerned here with criticizing the Chilean case as such, but with drawing some lessons from its experience. The situation we are discussing is a special case—the first two years of the implementation of a reform—and consequently a temporary situation. However, similar types of efficiency problems arise in many other countries. The present case is thus a useful illustration of the need for careful *ex-ante* analysis of educational reforms and plans in order to be able to anticipate what new resources will be required and how existing resources should be re-allocated.

This case also demonstrates very clearly the need for designing systems of teacher appointment which ensure an efficient utilization of teachers.

We now turn to a review of the process of teacher redistribution.

III. The redistribution of teaching staff

The Secretariat recommended that the existing distribution of teacher-hours per course and per school should be modified when necessary so as to ensure that (a) teacher-hours that were 'idle' or devoted to non-teaching duties should be used for teaching; and (b) every class should have a stated minimum number of students. This would mean that there would be greater utilization of teacher resources in 1968 than in 1967.

Forty days (10 March to 20 April 1968) elapsed between the date the headmasters handed in the questionnaires to the Secretariat and the completion of the redistribution of teachers. This process was carried out in three main steps: (i) analysis of the situation by school and by teacher, which produced a tentative scheme for the distribution of the existing personnel; (ii) redistribution of personnel by headmasters in each school; (iii) re-allocation of teachers between schools.

In describing the experience, we shall focus our attention on three main problems:

1. The determining of norms for the redistribution by the Secretariat.
2. Constraints upon the reallocation of personnel.
3. Administrative constraints influencing the work of the Secretariat and the running of the operation.

1. *Setting norms*

The first problem the Secretariat had to face was that of determining certain *norms* to be followed in the redistribution.

First, there was the norm concerning minimum class size. It was decided that for theoretical lessons, classes should have at least 40 students in the first form and 30 in the higher forms. In workshop classes, the minimum would be 20 and 15 students respectively.

The student/class ratio for the first form was thought to be acceptable according to international standards, taking account of the country's limited economic resources. This was consistent with the number of places to be provided by newly-built classrooms in the future. It was also argued that, although the effect of the size of classes on students' achievements had not been investigated in Chile, there were no indications that an increase in the average size of classes would lower quality significantly. According to past experience, it seemed reasonable to expect considerable drop-out rates for the four-year course. It was thus thought possible to set the size of classes for higher forms at a level lower than for first forms.[1]

The size of workshop classes was settled on the assumption that each class would be divided into two groups for workshop activities. In fact, the Secretariat acknowledged that in many cases this norm would be difficult to follow during 1968, since the problem of small-size teaching groups was mainly concentrated in workshop lessons. It was expected that small classes (that is, with fewer students than indicated by the norms) would probably disappear by 1969 as a result of increased enrolments.[2] It was, however, thought that headmasters should start to be acquainted with the administration's objectives.

Secondly, the Secretariat wanted to set some criteria which would ensure that the best possible use was made of existing teachers according to their field of specialization, educational level and professional experience. With this end in view, it was decided that in allocating teachers with 'idle' hours priority should be given by headmasters to those teachers with specializations directly related to the subjects to be taught and to those with higher educational and professional qualifications, determined according to a scale set by the Secretariat.

Finally, teachers with permanent appointments were to be given priority over those holding fixed-term contracts, and those teaching in the old third forms—to be replaced by the new first forms in 1968—over those teaching in other forms.

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[1] By the beginning of 1969, it seemed that second forms would in fact also need to have around 40 students per class.

[2] The number of teacher-hours for workshop activities would be kept constant in the future as far as possible.

These norms were drawn up in consultation with teachers' associations and later modified in the light of consultations with headmasters themselves during the period of reorganization.

2. *Redistribution of teaching personnel*

As a first step, the Secretariat analyzed the situation in each particular school. They had at their disposal the first approximate enrolment figures for each school.[1] Using the list of teachers by school and the number and type of hours that each teacher could offer, it was possible to make a tentative estimation of which schools would be in a position to absorb the 1968 enrolments with their own existing teacher resources, which schools would have a surplus, and which would have a shortage of teachers. By this means they succeeded in identifying, provisionally, the stock of surplus teacher-hours in each area which could be used to fill the shortages.

At the end of March 1968, after classes had just started, and when the approximate plan of redistribution of personnel was ready, each school was instructed by the Directorate of technical education to redistribute its own teaching personnel according to the norms set by the Secretariat. During the reorganization period the Secretariat was in constant communication with the headmasters and teachers in order to help them solve their particular problems. The Secretariat's analysis was adjusted when necessary to take account of redistribution done by headmasters themselves.

It should be remembered that there were two types of surplus teacher-hours: those corresponding to vacant teacher posts, and 'untaught teacher-hours'. Obviously, the latter are affected by more constraints when there is a question of redistribution. Taking this into account, teacher shortages were first overcome by using stocks of 'untaught' hours at the *local* level. At the final stage, the remaining local shortages were overcome by drawing on a national pool of vacant teacher-hours.

The redistribution of personnel and vacant teacher-hours between schools was affected by various *constraints*. It is clear that such a redistribution would pose no major problems if all teacher-hours could be interchanged freely between geographical areas, schools, forms and subjects. Surplus *vacant* teacher-hours were in fact close to this optimum; however, an administrative shortcoming had to be solved so as to make them fully interchangeable. Previously when a teacher retired, the hours left vacant, according to regulations, had to remain as a block in the same school, branch of secondary education, and speciality. Moreover, the teacher appointed to fill the vacancy had to be of the same category. It is obvious that if such practices had been maintained, the scope for manoeuvre would have been almost nil. Following the suggestion of the Secretariat, the Ministry of education, in collaboration with other administrative units concerned, abolished these regulations, thus making vacant teacher-hours freely interchangeable between teacher categories, schools and subjects within the four branches of technical education.

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[1] About two weeks before the beginning of the school year there is a provisional registration of students. Each student can register either in three secondary schools of the same type or in five different types of schools. Each school is allowed to select candidates on the basis of the results obtained in the basic education final examination and achievement and personality information from school records.

The commercial school of Talcahuano (Province of Concepción in the south-centre region) is a good example of a 'deficit' school which directly benefited from this change in regulations. In 1967, this school had 84 weekly teacher-hours available and required 131 additional teacher-hours to accommodate expanded enrolments. This was overcome with vacant teacher-hours transferred from eight different schools located in towns as far away as Antofagasta in the far north and Santiago in the centre. Six of these schools were of a branch other than commercial education.

As far as the transfer of individual teachers between schools is concerned, one would expect the three main constraints to be: (a) the distance between the new school and the teacher's place of residence and/or any other school in which he is teaching part-time; (b) teachers' attitudes towards transfers and (c) the 'fit' of the specialities of teachers with surplus hours with the requirements of 'deficit' schools. In the present case, the location of schools did not pose any serious problem since technical schools are located in towns which generally have at least three technical schools (the case would obviously have been different with primary rural schools, for example). However, teachers themselves proved in some cases to be rather reluctant to change schools, within the same town, speciality or even grades. They tended to consider that they had the right to continue working under the same conditions as those on which they had been initially appointed. The Secretariat held meetings with representatives of teachers' trade unions to discuss the subject, as a result of which it was agreed that teachers would be transferred only to schools within the same area as the school where they had been initially appointed. In fact, in no case was it necessary to use 'untaught teacher-hours' in one area to fill deficits in another area.

It should be remembered that surplus vacant teacher-hours were allocated only at a final stage, which gave flexibility of manoeuvre to the operation.

In addition, some teachers could not be re-allocated because their specialization did not fit into the curriculum as modified by the reform. As mentioned, this had been partly solved by re-training courses. However, in specialized technical schools, which had suffered a more radical curriculum change than other branches, some teachers would still need to be re-trained during 1968.[1]

Finally, there were the constraints that limited the application of the desired minimum size of classes. One of the typical cases in which a school has to function with relatively low student/class ratios is that of isolated rural schools serving thinly populated areas. In such cases, although the staff is restricted to the minimum, classes might need to be smaller than average. This problem is not relevant here since, as already mentioned, the authorities in Chile were dealing with schools located in towns, which also served surrounding rural areas. In the present case, the problem was that schools were overstaffed. In the first forms the demand for entry was sufficiently large for the desired minimum of 40 students per class to be generally achieved. On the other hand, this was not possible for workshop classes. If the stated norms of 20 and 15 students per workshop lesson had been followed, a certain number of workshop teachers would have been left idle. This was not considered an acceptable policy. From the strictly legal point of view the appointments of teachers with fixed-term contracts do not need to be renewed when their contracts expire. This could have been, theoretically, a way of reducing the number of teachers supplied. However, it had been agreed with teachers' associations that teachers would not be discharged in any instance. It should be pointed out that a sizeable proportion (about 80 per cent) of Chilean technical education teachers are *interinos.*[1] Only in the case of specialized technical schools was it considered appropriate to make use of legal regulations, and expiring contracts equalling 700 weekly teacher-hours were not renewed. In commercial education, some teachers who were teaching technical subjects in the old first and second forms had resigned their posts when these forms were cancelled by the reform (this was possibly because teaching was only a secondary and part-time activity for the teachers concerned). It was expected at the time that in 1969 the size of workshop classes would be closer to the desired level.

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[1] The new curriculum provides a wider scientific and theoretical base and is less specialized. For example, 'tailoring' comprises fifteen specialities which were provided separately before the reform.

To sum up, the process of redistributing personnel in Chilean technical schools serves to illustrate *constraints* which are likely to be found is most situations involving movements of labour. First, a change of teaching speciality or grade generally requires some adjustment effort or even re-training on the part of the teachers concerned—so does a change of schools. Transfers to another area mean a change in the individual's whole life. This is aggravated in the present case by the fact the redistribution covered a sizeable number of teachers and was to be completed in a very short time. It is thus not surprising to find that teachers' attitudes were not always favourable to the operation.

Secondly, some teachers may need to be re-trained so as to be assigned to new specialities.

Thirdly, once teachers are appointed it is not always possible to discharge them in cases of overstaffing or surplus, as illustrated particularly by the under-attainment of class size norms in workshop classes. In our opinion, the teachers' trade unions were in a strong position to defend the stability of teachers with fixed-term contracts, since shortcomings at the administrative level were mainly responsible for the situation and, as was mentioned before, the proportion of the teaching force appointed as *interinos* was very large because of shortcomings in the system of competitive entry.

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[1] It seems that the system of competitive entry which is required to obtain permanent appointments has not been universally applied by the administration.

Finally, as far as vacant posts are concerned the Chilean case shows the importance of eliminating the administrative barriers existing in many countries so that teaching posts can be transferred freely between schools, areas and types of education according to the changing needs of the educational system.

3. *Some aspects of the administration of the operation*

In the previous section we considered the constraints which limited the redistribution of personnel and students at the school level. Here we are concerned with the Secretariat's experience in actually carrying out the redistribution.

It is first necessary to be clear about the administrative processes involved in the operation, that is the activities to be performed and the power and responsibilities of each of the groups concerned.

The Secretariat is an advisory body[1] under the Directorate for technical education. Its role in this case was that of recommending various measures for the redistribution of the teaching staff. It was empowered to carry out all the tasks required to collect evidence and design the measures to be taken, such as: (i) carrying out the survey and making sure that the headmasters complied with the demands; (ii) drawing up a tentative redistribution of existing teacher-hours and setting redistribution norms to be used for instructing headmasters; and (iii) contacting headmasters, individual teachers and teacher associations for consultation.

As has already been mentioned, the headmasters were instructed to redistribute their personnel according to the norms decided on and to report to the Secretariat on teacher surpluses or deficits. At this stage, the Secretariat had the role of communicating with schools so as either to suggest modifications to the headmasters' reports when they did not fit in with the Secretariat's own analysis or to revise this analysis according to the school's own suggestions. The Secretariat in turn informed 'deficit' schools of vacant teacher-hours or personnel with 'untaught' hours which could be transferred to such schools. Once agreement had been reached the Directorate of technical education had to authorize the required transfers of personnel or decide on the appointment of new teachers to fill vacant posts. The proposals came from headmasters themselves or the Secretariat.

Until 1967 the proposals for teacher appointments were submitted to the Director of technical education at central headquarters after only one administrative step: entry at the Reception office.[2] In 1968 a new administrative step was introduced to respond to the needs of the operation. A team of three was appointed to examine the proposals in the light of the purposes of the redistribution and give advice to the Director prior to his approval. That is, taking into account the school survey results, the stated norms, and the Secretariat's recommendations on each school, the team had to see whether there was a need for the proposed appointment and whether the qualifications of the proposed teacher fitted in with the established qualification scale. The supervision of the operation, where possible, would be carried out by the regular supervisory staff.

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[1] It is formed by representatives of each of the four technical education branches, and of other Directorate departments (such as curriculum); teachers seconded to the Directorate; and advisers to the Director. It prepares studies following demands of the Directorate on problems such as curriculum, manpower requirements, etc. Only some of the members work on Secretariat activites on a full-time basis.

[2] The complete procedure was as follows: (i) entry at the Reception office; (ii) approval by

Two aspects of this process appear to have been successful:

1. The survey was successful to the extent that all headmasters responded to the questionnaire. It is noteworthy that for this stage the Secretariat had at its disposal a group of interviewers to work 'in the field'.
2. In spite of communication difficulties, headmasters and teachers and teacher associations were involved in the operation from the outset when the survey was prepared, the norms set and the redistribution designed. This seems particularly important in an operation such as this, in which a sizeable amount of resources had to be re-allocated and new criteria introduced by the central administration within a period of time as short as two months. It is obvious that it takes time for teachers to become informed and aware of the suitability of the changes proposed, which were designed to overcome shortcomings for which they were not directly responsible.

The process appears to have been handicapped by the following problems:

1. Shortage of personnel in the Secretariat. The analysis of the results of the survey and the running of the operation were in the hands of too small a team.[1] We should remember that they were dealing with 100 schools; as far as the number of individual teachers is concerned, it was estimated at between 2,000 and 3,000. The team had to go into the details of each school situation and cope with the entire burden of dealing with individual schools from the centre.
2. Administrative procedures for authorizing transfers and making new appointments were too slow. For example, it was necessary to set up a temporary appointments mechanism, by which proposed teachers could start working and being paid while waiting for their appointments to be issued.
3. There was very little supervision of the implementation of the operation, because of the shortage of supervisory personnel.

This completes our description of the set of measures taken to improve teacher utilization in Chilean technical education and the problems encountered—an experience which made the educational authorities aware of the need for designing a more efficient system of teacher appointment. As we have seen, the operation itself needed to develop new mechanisms, which meant that (i) *norms* for allocating existing teachers and appointing new ones had to be established by the central

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the Director; (iii) secretarial work with the file at the Office of personnel; (iv) issue of the appointment at the Appointements office; (v) final approval by the Treasury concerning its compatibility with the approved budget.

[1] The team comprised two persons, one of them part-time. Other members of the Secretariat collaborated only indirectly.

administration (such as class size and scale for ranking teachers according to qualifications); (ii) means for collecting *information* on school units needed to be developed; (iii) *communication channels* between the central administration and the schools needed to be established, ensuring a two-way flow of information; (iv) *administrative practices* needed to be corrected, first, in order that they might be made more flexible; secondly, so as to incorporate efficiency criteria in decision-making (i.e. the establishment of the team of advisers to the Director); thirdly, to allow for free interchange of vacant teacher-hours; and (v) it was recognized that more supervisory staff should be available if the operation was to be successfully completed.

In the final section of Part IV we shall describe the features of the new system of teacher appointment developed in 1969 on the basis of this. We now turn to analysing the results achieved by the operation.

IV. Results of the measures taken to improve efficiency

We are concerned here first with measuring in some ways the effects of the redistribution in terms of productivity and costs. Later, we shall deal with the changes introduced in Chile in the system of teacher appointment, which directly followed the operation.

1. *Increase in output as a result of improved efficiency*

We shall be concerned here with the results in all three types of technical education and in all the forms as a whole. However, it should be noted that first forms were, to a large extent, the most affected by the measures.[1] It is also possible that industrial, commercial and 'specialized' technical schools were differently affected by them.

The over-all results are given in Table 3. Between 1967 and 1968, total enrolments in industrial, commercial and specialized schools increased by 35.6 per cent, from 36,443 students to 49,428. Such expansion was accommodated within the 53,781 official weekly teacher-hours existing in the appointment[2] of 1967. This meant that 7,355 teacher-hours which were in the appointment of teachers but not taught

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[1] It should be recalled that the large expansion of first form enrolments made the application of the class-size norms easier here than in higher forms, where on the other hand most workshop teachers were concentrated.

[2] See definition in Note 1 to Table 1.

TABLE 3. Enrolments, classes and teacher hours in industrial, commercial and 'specialized' technical (state) schools, 1967 and 1968

Items	1967			1968			Percentage increase		
	3rd form	Other forms	Total	1st form	Others forms	Total	3rd/1st form	Other forms	Total
Number of pupils	15 209	21 234	36 443	23 758	25 670	49 428[1]	56.2	20.9	35.6
Number of classes	468	750	1 218	588	843	1 431	25.6	12.4	17.5
Pupil/class ratio	32.5	28.3	29.9	40.4	30.5	34.5	24.3	7.8	15.4
Number of teacher—hours per week (appointment)			53 781	20 580	33 201	53 781			
Number of teacher-hours effectively used	18 330	28 096	46 426	20 580	33 201	53 781[2]	12.3	18.2	15.8

[1] Enrolments at 31 May 1968.

[2] See footnote 1 on page 290.

SOURCE Ministry of education and Technical Secretariat for technical education.

during 1967 were used for teaching in 1968.[1] The average size of classes was increased from 29.9 students to 34.5.

Out of the total increase in output, 48.9 per cent was due to the utilization of existing 'idle' teacher hours and 51.1 per cent to the increase in the size of classes.[2]

Such gains can be appreciated in terms of teachers' productivity, that is 'output', measured in terms of number of pupils taught per unit of teacher input. To the extent that the output of educational systems consists of students' achievements as well as the number of students, we can here speak of teacher productivity only in quantitative terms. In 1967, 25.8 students were taught per teacher-hour *in the appointment*; this increased to 34.5 in 1968.[3] The productivity of the teacher-hour *taught* increased as much as the size of classes: 29.9 to 34.5.

2. *Costs implications of improved efficiency*

(a) Recurrent costs per student

Table 4 shows trends in recurrent expenditure between 1965 and 1968 (lines 1 to 4). Two points should be noted here. First, recurrent expenditure decreased between 1966 and 1967 owing to a reduction in the number of students and teachers resulting from the transfer of classes from technical schools to the seventh and eighth grades of basic education schools. Secondly, in spite of the fact that the number of teacher-hours in the appointment remained constant, expenditure on teachers' salaries increased between 1967 and 1968 by 27.8 per cent.[4] This was mainly a result of an increase in teachers' salary scales of about 20 per cent;[5] the rest of the increased expenditure on teachers' salaries would at least partly correspond to increased seniority of the teaching force. That is, although new—probably young—teachers were incorporated to fill vacant posts, the proportion of young teachers is likely to be smaller in 1968 than in 1967 since the bulk of the teacher force did not change between these two years. It is not possible to know with the data available whether increased seniority could account for all the remaining 7.8 per cent increase. If this were not so, it is likely that the qualification structure of teachers changed between 1967 and 1968.[6]

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[1] As already mentioned, there were still some 'idle' teacher hours during 1968. This has been considered as negligible for our purposes.

[2] That is, if the size of classes had been kept constant at 29.9 students in 1968, only 42,787 students could have been accommodated within existing teacher-hours. This means that out of the total increase in enrolments (12,985), 6,344 were 'produced' by utilizing existing surplus teacher-hours and 6,641 by increasing the size of classes.

[3] In fact, the 1968 ratio would be somewhat lower if we accounted for surplus teacher hours still existing in 1968.

[4] This meant that the original intention of freezing the 1968 budget could not be fulfilled.

[5] For example, the monthly salary of a teacher with a teaching load of 30 hours and 30 years of service (premium for teacher-training diploma included) rose from 1,393 to 1,670 escudos (at constant prices) between 1967 and 1968.

[6] See J. D. Chesswas, 'Tanzania: factors influencing change in teachers' basic salaries' (in Volume I of this series) for further references on the subject.

Table 4. Teacher costs and total recurrent costs per student in industrial, commercial and 'specialized' (state) technical education, at constant 1968 prices (escudos)

	1965	1966	1967	1968	Percentage difference 1967/68
Deflation index	*2.3622*	*1.8382*	*1.2664*	*1.0000*	
Teachers' salaries[1]	73 651 020	81 616 080	60 027 360	76 700 000	+ 27.80
Salaries of other personnel[2]	10 354 718	12 663 911	9 534 599	11 942 076	+ 25.25
Other recurrent expenditure	3 841 457	10 920 379	9 971 254	10 789 300	+ 8.20
Total recurrent expenditure	87 847 195	105 200 370	79 533 213	99 431 376	+ 25.00
Enrolments[3]	57 872	66 090	36 443	49 428	+ 35.66
Average recurrent cost per student	1 518	1 592	2 182	2 012	− 7.80
Average teacher cost per student	1 273	1 235	1 647	1 552	− 5.80
Other personnel costs per student	179	192	261	242	− 7.30
Other recurrent costs per student	66	165	274	218	− 20.00

1. Estimated on the basis of a sample.
2. Headmasters, administrative personnel and teaching assistants.
3. Enrolment figures include, in 1965, students in the 'old' first and second forms and higher and in 1966, in the new seventh grade and old second form.

NOTES Expenditure data cover expenditure in day courses (evening training courses and boarding are excluded) and central administration made on recurrent budget sources and special funds drawn from the capital budget. Expenditure on salaries includes the contribution made by the state to pension funds (5 per cent of the total salary bill).

The salaries paid to teachers transferred to basic education schools but still administratively dependent from technical education have been deducted. This has been estimated at 10,983,891 and 12,690,000 escudos in 1967 and 1968 respectively (constant 1968 prices).

SOURCE Directorate for technical education. Budget office (unpublished data).

The following points can be made about trends in *recurrent costs per student* (see lines 6 to 9 in Table 4):

1. Average teacher costs per student increased significantly between 1966 and 1967, after remaining stable in 1965 and 1966. It is difficult to draw a conclusion from this comparison, since in 1967 technical schools were running the old forms 3, 4 and 5, which had a large proportion of workshop activities, whereas in 1966 they provided, in addition to this, courses in the old second form, which had somewhat less workshop activities, and the 7th grade of general education (see Figure 2). Since workshop lessons are now in smaller teaching groups than theoretical lessons it is likely that teacher costs per student are higher in forms 3, 4 and 5 than in form 2 plus grade 7. This means that the increase in unit teacher costs observed between 1966 and 1967 might simply be a result of the changeover from the old to the new structure. However, the size of the increase in costs—as much as 37 per cent—suggests that it might be also partly due to increased unused teacher capacity resulting from the introduction of the educational reform. However, the testing of this conclusion would require further data.
2. Average teacher costs per student were reduced between 1967 and 1968 in spite of the increase in average teacher salaries mentioned before. This would indicate increased efficiency in the use made of teachers. If average teacher salaries had remained constant at the 1967 level, unit teacher costs would have diminished by as much as 26 per cent instead of the observed 5.8 per cent.[1]
3. Total recurrent costs per student diminished by 7.8 per cent. The decrease in teacher unit costs (5.8 per cent) accounts for 56 per cent of this reduction in total unit costs; the sizeable decrease in 'other' unit costs—20 per cent—accounts for only 33 per cent.[2] This illustrates an obvious fact: total unit recurrent costs are much more sensitive to changes in teacher costs than in 'other' costs, since expenditure on teachers' salaries accounts for the bulk of recurrent expenditure. There is a technical point worth mentioning here: the reduction in average recurrent costs observed above is due to the fact that the recurrent cost of educating one *extra* student in 1968, i.e. the marginal cost, was almost nil. In general terms, when marginal costs are lower than average costs, it means that when one extra student is enrolled expenditure varies proportionally less than enrolments. In this case, the increase in expenditure per additional student would be nearly zero until under-utilized teacher capacity was put to its maximum use. At that point, extra teacher-hours would need to be added in order to enrol additional students, and marginal costs would start to have a positive value.

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[1] It should be noted that the unit costs for 1967 and 1968 are not strictly comparable, since the curriculum of the old 3rd forms in 1967 differed from that of the new 1st form introduced in 1968.

[2] The decrease in other personnel costs accounts for the rest.

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D (b)	1965	2	1	1	1	5		—	—	—	5	boarding	140	—	140
												day	2	—	2
												total	142	—	142
	1966	2	2	1	1	6		—	—	—	6	boarding	189	—	189
												day	—	—	—
												total	189	—	189
	1967	5	2	2	1	10		—	—	—	10	boarding	257	—	257
												day	70	—	70
												total	327	—	327
[E] (bh)	1965	2	2	2	2	8	science	1	1	2	12	boarding	241	48	289
							arts	1	1	2		day	—	—	—
							total	2	2	4		total	241	48	289
	1966	2	2	2	2	8	science	1	1	2	12	boarding	266	72	338
							arts	1	1	2		day	—	—	—
							total	2	2	4		total	266	72	338
	1967	3	2	2	2	9	science	1	1	2	13	boarding	308	80	388
							arts	1	1	2		day	—	—	—
							total	2	2	4		total	308	80	388
F (b)	1965	3	3	1	—	7		—	—	—	7	boarding	234	—	234
												day	3	—	3
												total	237	—	237
	1966	3	3	3	1	10		—	—	—	10	boarding	336	—	336
												day	4	—	4
												total	340	—	340
	1967	3	3	3	3	12		—	—	—	12	boarding	401	—	401
												day	6	—	6
												total	407	—	407

School	Year	Number of classes at each grade											Enrolments		
		8 S. 1	9 S. 2	10 S. 3	11 S. 4	Total	Special-ization	12 S. 5	13 S. 6	12-13 S. 5-6	Total	Residence	8-11 S. 1-4	12-13 S. 5-6	Total
[G] (bh)	1965	3	3	3	3	12	science	1	1	2	16	boarding	406	68	474
							arts	1	1	2		day	—	—	—
							total	2	2	4		total	406	68	474
	1966	3	3	3	3	12	science	1	1	2	16	boarding	419	99	518
							arts	1	1	2		day	3	—	3
							total	2	2	4		total	422	99	521
	1967	5	3	3	3	14	science	1	1	2	18	boarding	411	110	521
							arts	1	1	2		day	63	1	64
							total	2	2	4[2]		total	474	111	585
H (d)	1965	3+3	3	2	2	13		—	—	—	13	day	339	—	339[1]
	1966	3+3	3+3	3	2	17		—	—	—	17	day	496	—	496[1]
	1967	3+3	3+3	3+3	3	21		—	—	—	21	day	610	—	610[1]
I (h)	1965	6	4	2	2	14	science	1	1	2	18	boarding	—	—	—
							arts	1	1	2		day	398	66	464[1]
							total	2	2	4		total	398	66	464
	1966	4	6	4	2	16	science	1	1	2	20	boarding	—	—	—
							arts	1	1	2		day	464	64	528[1]
							total	2	2	4		total	464	64	528
	1967	6	4	5	4	19	science	1	1	2	23	boarding	—	—	—
							arts	1	1	2		day	577	77	654[1]
							total	2	2	4		total	577	77	654

J (hd)	1965	4+4	4+4	4	4	24	science	1	1	2	28	day	813	85[3]	989[1]
							arts	1	1	2					
							total	2	2	4					
	1966	4+4	4+4	4+4	4	28	science	1	1	2	32	day	958	100[4]	1 058[1]
							arts	1	1	2					
							total	2	2	4					
	1967	4+4	4+4	4+4	4+4	32	science	1	1	2	36	day	1 134	125[5]	1 259[1]
							arts	1	1	2					
							total	2	2	4					
K (d)	1965	6+5	6+4	6	6	33		—	—	—	33	boarding	—	—	—
												day	1 111	—	1 111[1]
												total	1 111	—	1 111
	1966	6+6	6+5	6+4	6	39		—	—	—	39	boarding	—	—	—
												day	1 267	—	1 267[1]
												total	1 267	—	1 267
	1967	14	8	8	10	40		—	—	—	40	day	1 369	—	1 369[1]

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[1] Students in hostels separate from the school are regarded for the purpose of this study as day students.

[2] 5 of a total of 55 at grade 12, and 4 of a total of 56 at grade 13, were taking mixed combinations, i.e. arts subjects plus mathematics or another science subject.

[3] Statistics available do not break down to science and arts. Arbitrarily divided 52 science, 33 arts from a calculation based on the 1966 distribution by grade.

[4] 55 science, 45 arts.

[5] 60 science, 65 arts.

Appendix VI

Unit expenditure by nature (per boarder for boarding expenses), total expenditure per student, and total income per student (in shs.)

Category	School *A* (b)	*B* (b)	C	D (b)	[E] (bh)	F (b)	[G] (bh)	H (d)	I (h)	J (hd)	K (d)
Expenditure											
Tuition	160.24	122.96	124.08	200.34	191.00	228.58	139.93	61.27	131.33	102.82	91.88
Non-teaching personnel	139.62	203.79	76.85	125.68	197.00	180.53	168.53	72.86	152.69	47.60	52.03
Maintenance	117.20	137.26	39.29	77.18	204.00	157.51	154.36	31.98	96.74	31.01	37.23
Administration	46.55	67.70	50.78	51.80	59.00	33.26	86.30	34.44	35.70	11.52	11.90
Transport	17.88	93.00	36.14	14.62	57.00	50.19	68.14	3.07	3.80	2.23	2.97
Total	481.49	624.71	327.14	469.62	708.00	650.07	617.26	203.62	420.26	195.18	196.01
Boarding	339.65	466.38	551.06	519.97	596.00	391.15	489.72	—	—	—	—
of which % food	*70.50*	*86.30*	*83.40*	*86.60*	*83.80*	*84.80*	*90.80*	—	—	—	—
Weighted total	767.21	1 031.34	457.92	932.70	1 304.00	1 036.05	1 090.71	203.62	420.26	195.18	196.01
Uniforms	55.54	61.16	6.83	92.80	69.00	65.85	8.73	—	—	—	—
Total including uniform	822.75	1 092.50	464.75	1 025.50	1 373.00	1 101.90	1 099.44	203.62	420.26	195.18	196.01
Income											
Fees	470.04	503.04	414.43	512.63	599.87	517.52	496.00	3.92	174.92	3.30	0.20
Capitation	411.54	453.55	200.00	437.10	517.95	496.35	501.56	156.25	214.37	180.00	156.52
Block grants	125.34	124.32	80.14	89.44	126.85	91.74	99.98	73.59	71.62	36.42	33.56
25 % unskilled wage grant	27.16	58.71		20.23	13.21	39.99	14.79	5.64	15.10	6.99	9.24
Other	10.45	11.51	27.43	5.32	63.42	30.58	25.00	5.89	10.72	6.35	1.41
Total income per student	1 044.53	1 151.13	722.00	1 064.72	1 321.30	1 176.18	1 137.33	245.29	487.21	233.05	200.93
% of income spent	*78.80*	*94.90*	*64.40*	*96.00*	*103.90*	*93.70*	*96.70*	*83.00*	*86.30*	*83.80*	*97.60*

Uganda

21

The use of cost evaluation in the planning of Makerere University College

prepared by Nicholas Bennett

Mr. Nicholas Bennett, IIEP, was for four years working in the Manpower planning section of the Ministry of planning in Uganda. In this capacity he participated in the planning of the development of the University of East Africa and more specifically of Makerere College. In preparing the report he was greatly helped by the advice and comments of Mr. Philip H. Coombs, Director of Research at the IIEP.

Introduction

Another case-study in this series traces the preparation of the educational section of the Uganda Second Five-year Plan.[1] Although the University of East Africa was dealt with in that paper, it was not possible to look in detail at the planning of Makerere University College. In part this was because the plan for Makerere, a semi-autonomous and federal institution, had to fit both into the Ugandan Five-year Plan, covering the period 1966/67–1970/71, and into the University Triennial Development Plan (1967/68–1969/70).

In the present case study we try to show how an agreed and implementable plan for Makerere was arrived at. For details of the over-all economic and educational planning process in Uganda the reader is advised to turn to the above mentioned study.

The story told here, however, reveals among other things, what sort of problems arise when two groups of people with somewhat different objectives and concepts are given the task of preparing a plan, separately and together, for the same institution. One group was the government planners whose central concern was that the university produced, at the lowest possible cost, the manpower needed for the development of the country, consistent with generally accepted standards of quality. The other group was the university planners who, though aware of the university's training responsibilities and the problem of costs, were mainly concerned with promoting its academic excellence and its status in the academic world.

The problems engendered by these differences of outlook were intensified by the fact that Makerere was part of a federal institution in a non-federal political situation. All three East African governments—Uganda, Kenya and Tanzania—were to some extent jointly in control of each of the three university colleges (Makerere, Nairobi and Dar-es-Salaam), yet in fact there was a minimum of effective control, at least as far as Makerere was concerned.[2]

Despite these difficulties an agreed and accepted plan for Makerere was finally drawn up. During the three years spent on the preparation of this plan, mistakes were inevitably made and useful lessons learned, both by the government and the university planners. Our object in this study is to make these lessons available to others. A few of them can be stated in summary form at the outset:

1. Planning cannot be effective unless there is the fullest co-operation and consultation between all interested and involved parties. This is especially so where there are no direct and operable lines of control.
2. Before work on a plan for a semi-autonomous organization begins, the basic objectives and goals of this plan must be agreed by all who are to be involved in its implementation.

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[1] Nicholas Bennett, 'Uganda: Educational cost evaluation', see page 13.

[2] We do not attempt in this study to discuss the experience of the Kenyan and Tanzanian governments in exercising control over their respective university colleges.

3. Because of the natural desire for academic excellence in all universities, it cannot be expected that university planners will automatically take advantage of potential economies of scale as a university expands.
4. The problems of time must be taken carefully into account when preparing a plan. For example, aid negotiations can take a considerable length of time and staff recruitment and physical implementation require quite long periods, not to mention the time needed to prepare a plan and gain its acceptance.
5. Planning is greatly facilitated if university estimates are presented in such a way that information on unit costs per student for each faculty, and on major cost trends, is readily evident.
6. Where a university in a developing country is largely financed by the government, it is appropriate to aim for the same standards of economy in the university as in other government-financed activities.
7. There are always more ways than one to achieve a specific educational goal, but the best ways may sometimes be precluded if one treats the existing university organization and practices as sacrosanct.
8. Figures from whatever source should always be checked for accuracy before being used as a basis for decision.
9. Where there is an evident need to improve financial control over semi-autonomous organizations, the way in which the control is applied is exceedingly important.

This paper is mainly concerned with the cost aspects of university planning. In the particular case under review, the costing techniques employed were simple enough to be applicable in many other developing countries. Existing and past costs were analysed, norms established, and projects studied. Although such techniques as cost-benefit analysis were used in the over-all planning process in Uganda, they were not applied to the university programme as such. Nevertheless, a feasible and internally consistent plan was finally produced. Of particular interest, it provided for a downward trend in the recurrent costs per student, which were falling at about 5 per cent per annum. This. in a world of rising educational costs, was no mean achievement.

I. Historical background

The University of East Africa is a federal institution with a central council and three semi-independent constituent colleges: Makerere University College, University College Nairobi and University College Dar-es-Salaam.

Makerere was established in the colonial period to cater for all three East African countries. For many years it provided various high-level sub-professional courses and, starting in 1953, offered degrees through a special relationship with the University of London. In 1961 University College Nairobi (formerly the Royal College) and University College Dar-es-Salaam, were also given university status. It was apparent that with total combined enrolments of under 1,500 for the three colleges some co-operation would be desirable. Thus in July 1963, the University of East Africa was formed.

It was an attempt at inter-country co-operation in higher education designed specifically to achieve economies of scale in the expensive professional faculties.[1] The theory was that each university college would have certain faculties that the other two university colleges did not have, and that these would be jointly financed and shared by the three countries. Thus Makerere University College was allocated agriculture and medicine, University College Nairobi, engineering and veterinary science, and University College Dar-es-Salaam, law. The places at these professional faculties were to be equally shared by students from the three countries. The other faculties—arts, social science, science and education—were to exist in each of the three colleges and thus would be known as 'common faculties'. Though Ugandan students could study in Nairobi and Dar-es-Salaam and vice versa, the total number of students from any one country in the combined common faculties of all three university colleges could not exceed the number of places in the common faculties in that particular country's institution.

Even before the university was formally constituted, work had begun on the preparation of its first development plan covering the period 1964/65–1966/67. In 1962 a rough assessment of the three countries' manpower requirements for the period 1961–1966 was made. This was followed by a conference attended by aid donors, university personnel and government representatives at Lake Como in Italy in 1963.

At this conference it was evident that the recurrent fund demands of the university colleges were in some respects excessive. Hence it was decided to create an Economy Commission which would study the budgetary estimates of each university college in detail and establish norms in relation to which reductions could be suggested.

Only after this Economy Commission had made its recommendations was a University Grants Committee (UGC) formed. It met early in 1964 and rapidly made allocations for each of the three university colleges for each year of the triennium 1964/65 to 1966/67.

The planning problems for the first triennium were not complex. All three colleges in the university were expanding from a very low base (see appendix I);

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[1] We say 'was' because the University of East Africa is now evolving away from its earlier design. At the time of this study both Kenya and Tanzania had started medical faculties, both were planning to start agricultural faculties, Uganda and Kenya had started law departments, and Uganda was endeavouring to start an engineering faculty. The fact that the three university colleges would eventually develop into three distinct universities was recognized by the Philip Commission (1967) which prepared the Treaty for East African Co-operation. This commission recommended that a working party on higher education be set up to decide what form of co-operation there should be when the university ceased to exist in its present form. Despite these changes, however, there are still useful lessons to be learnt, we believe, from the experiences laid out in this paper.

thus rapid expansion was necessary on all fronts. The available manpower estimates, rough as they necessarily were, showed that there was little early danger of overproducing any category of university graduate. The acceptance by governments and international donors alike that rapid expansion was essential meant that all would endeavour to minimize the constraints imposed by the limitations of resources.

The planning techniques employed were extremely simple and the plan which emerged was not only rapidly put into action but in the enthusiasm of the time it was substantially overimplemented.

The basic difficulties of planning a federal institution only really appeared during the preparation of plans for the second triennium 1967/68–1969/70. Each government by then had established a planning department, but each had a development plan covering a different period. To some degree their philosophies of university education also differed, as did the intensity of their resource scarcities and their approaches to assessing manpower needs.

It is not surprising, therefore, that planning for the university in this second period was characterized by something less than clear cut and concerted action by the university and the three governments. The success of the first triennial plan had been greatly aided by the fact that all major aspects of the plan had been prepared by and for the university in plenty of time. Planning for the second triennium, on the other hand, suffered from a lack of clear cut lines of responsibility. Hence parallel planning activities by different groups were almost bound to cause confusion.

This lack of clear cut responsibility for university planning in Uganda resulted in part from the semi-autonomous position of the university college, with respect both to the university itself and to the government. But since the governments of the three countries concerned were expected to provide the bulk of support and were beset by serious financial shortages, they could hardly be expected to be disinterested in how the university's financial requirements were arrived at, how efficiently the money would be used, and what the resulting contribution to national development might be. Even within the Ugandan government itself, there was a certain lack of clarity regarding university planning. For historical reasons, the Assistant Chief Education Officer (Planning), was the responsible official for all capital development of schools and colleges, but the Under Secretary (Finance) of Establishments was entirely responsible for university development. This lack of clarity with regard to who was responsible for planning and of means to enforce control over university expenditures meant that in point of fact there had been relatively little such control by the government. Moreover, the idea of planning was not yet widely accepted and there was a widely held feeling that the more spent on university education the better.

As Uganda and the other East African governments became more acutely aware of their resource scarcities, and more conscious of the need for planning, the necessity for greater financial control over the university also became more apparent. At the same time, the university itself became more aware of the need for careful cost evaluation and cost-effectiveness studies.

All this had important implications for the handling of foreign aid, which played a large role in the development of the university. Though legally each government was responsible for the capital development at the college in its country, the colleges had independently sought, negotiated and committed their governments to aid agreements, often without passing through the normal channels. In some instances the costs of the facilities being constructed with the aid (which the governments were in most cases committed to repay) were far out of line with the costs of similar facilities in other sectors of government activity.[1]

These problems of responsibility and control were soon to become even more complicated when the East African countries began adding 'national' activities to the 'approved' university activities within their borders (the latter including all the 'common faculties' and the shared 'professional faculties' approved for the university financing by the University Council). The national activities, however, would be the sole responsibility of the particular government (e.g. the Faculty of Medicine and the Domestic Science Diploma Course at Nairobi, or the Centre for Continuing Education and the Institute of Education at Makerere).

The resulting combination of co-operative financing and unilateral financing, in some cases for activities on the same campus, was bound to make for complications. But even apart from these 'national activities' the financing of the University of East Africa was a complicated affair.

As already mentioned, capital finance was solely the responsibility of the government of the country in which the particular facilities were located.

Recurrent expenditure of the university, however, was financed centrally through a university grants committee on a triennial basis. The system worked as follows: (See appendix II for detailed diagrammatical representation.)

(a) the triennial estimates of each college were submitted to the UGC which examined them, making reductions where this seemed warranted;

(b) the number of students at each of the colleges for each of the three years was estimated;

(c) each student was charged 6,000 shs.[2] per annum academic fees, payable directly to the colleges. In the case of East African students the fee was almost always paid by their respective governments. (The fees for some classes of post-graduate students were less than 6,000 shs. per annum.);

(d) direct income from donors and from other sources was estimated (not including the provision of free staff or the topping up of expatriates' salaries, which normally did not appear in the estimates),

(e) the fee income and other anticipated direct income (from donors, rents, securities, etc.) were subtracted from the total approved financial requirements for each college, leaving for each year of the triennium a balance designated as 'net requirements';

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[1] For example, some three-bedroomed staff houses built at Makerere with money from a British loan cost more than 100,000 shs. each. A comparable house built by the government's National Housing Corporation cost 88,000 shs. and could be built for the government by private contractors for as little as 70,000 shs.

[2] The rates of exchange prevailing in late 1965 were 1 Ugandan shilling = £0.058 sterling or $0.14.

(f) an agreed portion of those net requirements was financed by the East African Common Service Organization (EACSO) and the remainder by each of the three East African governments in proportion to the number of sponsored students each had at the University of East Africa. The amount paid per student by the government was known as the capitation grant;[1]

(g) residence fees, and bursaries to students (to cover purchase of books, clothes, etc.) were the direct responsibility of the student's own government (unless he was a 'private' student).

To illustrate how this rather complicated system of financing worked, table 1 takes 1965/66 and shows how the university was financed on a per student basis.

TABLE 1. Financing of recurrent expenses for sponsored student 1965/66

	Per student cost in shs.
Each Government	
Tuition free	6 000
Capitation (share of 'net requirements')	7 820
Residence fee	2 500
Bursary	2 500
Total government	18 820
Non-Government	
EACSO[1]	5 660
Other[2]	1 000
Total non-government	6 660
GRAND TOTAL	25 480

1. EACSO is, of course, financed indirectly by the three governments.
2. Not including topping up of expatriates' salaries, or salaries paid direct to staff by outside aid donors.

During the first triennium considerable problems were encountered with this method of financing. By its very nature it required very accurate planning techniques to forecast student numbers and various recurrent costs over the triennium. Since the 'net requirements', which provided more than half the revenue for the university colleges, were not directly tied to student numbers, and since tuition fees were not directly related to actual cost per student, any unforeseen change in the number of students could affect marginal costs quite differently from marginal revenues and leave an unplanned deficit (or possibly a surplus). During the first triennium student numbers at two of the university colleges were considerably higher than estimated, and the extra revenue obtained from the fees was insufficient to cover the extra expense. In the third college, due to weaknesses in the original estimate, the college found itself with a considerable deficit. Thus, the UGC had to be recalled into an emergency session, midway through the triennium.

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[1] At the time of the 1964 University Grants Committee, fees were only about 1,000 shs. per student and 30 per cent of net requirements were met by EACSO. Later when fees were raised to 6,000 shs., EACSO took up 42 per cent of the reduced 'net requirements'. After December 1967 it was agreed that in future 50 per cent of net requirements would be financed by the newly formed East African Community. Thus the governments individually would pay half, in relation to their number of sponsored students, and the community would pay the other half.

So it was that the university moved toward its second triennium with a complex and cumbersome system of financing, some practical experience in dealing with its difficulties, and considerable lack of clarity as to the location of responsibility for planning, or the locus of ultimate authority for accepting or rejecting plans, or for enforcing financial control.

II. The Uganda government and the planning of Makerere

Early in 1965 a working party on education and manpower was set up jointly by the Ugandan ministries of planning and education. Its assignment was to prepare the education section of Uganda's Second Five-year Plan (1966/67-1970/71) within a macro framework which included such indicators as recurrent and capital expenditure targets, and manpower projection figures. Its membership was drawn from government ministries, the university, the teaching profession and the general public.[1]

Although Makerere University College was to a large extent autonomous, and though its recurrent financing was not the sole responsibility of the Ugandan government, the working party felt that it had no choice but to prepare a plan for Makerere. This was both because a large proportion of the recurrent and capital finance for the university college came from the government, and because without a definite plan for the local university college it would not be possible to prepare a comprehensive plan for the rest of Uganda's educational system.

Makerere University College was considered almost as if it were a government institution. Since other aspects of this process are dealt with elsewhere[1] we will confine our attention here to the particular exercises in cost evaluation and cost revision that arose for Makerere.

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[1] For details about the working party's analysis and conclusions, and the whole educational planning process, see 'Uganda: educational cost evaluation', p. 13.

The working party decided to base its plan for the expansion of Makerere University College on the available manpower projections. These implied an increase in undergraduate enrolments from their 1965/66 level of 940 to 1,610 in 1970/71.

A. Preliminary costing

1. *Recurrent costs*

Before attempting to estimate possible increases in recurrent costs, a study was made of the existing expenditures of the college and how these had moved over the previous four years. Tables 2 and 3 show the results of this study, based on an analysis of *actual* expenditures for 1961/62, 1962/63 and 1963/64, and of *estimated* expenditures for 1964/65 and 1965/66.

TABLE 2. Recurrent costs per pupil by faculty, Makerere University College, 1964/65 (in shillings per annum)

Faculty	Dept. expend.	Faculty admin.	Library	Cent. admin.	Amenities	Misc. grants	Resid. halls	Total
Arts and soc. sc.	5 202	180	1 056	3 518	658	124	2 634	13 372
Agriculture	25 722	820	1 056	3 518	658	124	2 634	34 532
Education	4 550	706	1 056	3 518	658	124	2 634	13 246
Science	17 018	532	1 056	3 518	658	124	2 634	25 540
Fine art	19 486	180	1 056	3 518	658	124	2 633	18 656
Medicine	19 144	966	778	3 518	658	124	2 634	27 822

TABLE 3. Numbers of students; ratio of students to established staff; and recurrent costs per pupil, 1961–66, Makerere University College

	1961/62	1963/64	1964/65	1965/66
Students	924	1 038	1 051	1 224
Student/staff ratio	7.4	7.5	7.6	8.3
Faculty and department cost	10 762	10 870	11 918	11 172
Admin. residence and other overheads	8 138	7 650	7 722	8 148
Total cost per student	18 900	18 520	19 640	19 320

The working party neglected the cost of bursaries paid to students. Even with this amount of 2,500 shs. added, the figure for 1965/66 in table 3 (19,320 + 2,500 = 21,820 shs.) is substantially lower than the cost per student of 25,480 shs. shown earlier in table 1. There are three main reasons for this difference:

1. Table 3 does not include the university central office expenditure;
2. Private students make no contribution either to the capitation cost or the EACSO payments and thus are not included in the calculation of cost per

student to the governments shown in table 1, whereas they are included in the cost per student shown in table 3;

3. Table 3 refers only to Makerere, which in 1965/66 had the lowest per student costs of the three colleges, while table 1 refers to all three university colleges.

The working party also made a detailed analysis of the established teaching staff at Makerere, the results of which are shown in table 4.

A further analysis of the ratio of (a) professors to (b) readers and senior lecturers to (c) lecturers, showed this ratio to be 1.2:2:4 in 1964/65, compared with the accepted norm of 1:1:4.

TABLE 4. Student/established teaching staff ratio by faculty

	1961/62	1962/63	1963/64	1964/65	1965/66
Arts and social science	8.2	7.4	10.2	11.2	12.8
Agriculture	3.1	3.4	4.1	4.0	5.1
Education	20.1	13.0	16.1	15.7	17.5
Science	6.4	4.0	4.9	5.2	6.0
Medicine	4.6	4.6	5.3	5.3	5.3
Over-all	7.4	5.9	7.5	7.6	8.3

Upon analysing the figures given in table 4 the working party concluded that the expenditures both on teaching and on administration and other overheads were unnecessarily high. It seemed apparent that the university was not taking proper advantage of the potential economies of scale.

Accordingly the working party made specific recommendations to reduce the recurrent cost per student during the coming plan period.

As regards teaching costs, it was felt that Makerere should aim to increase its over-all student/staff ratio from the 1965/66 figure of 8.3:1 to 15:1 by the end of the new plan period.[1] In this manner all the planned expansion in enrolments could be achieved with very little increase in staff. Specific recommendations on student/staff ratios were made for each department at the college. For instance, it was suggested that since the ratio in the chemistry department was 19.3:1, this same ratio should be feasible for all the other science departments, thus cutting the total costs per student in the science faculty by 8,600 shs. in 1970/71 from its 1964/65 level of 25,540 shs. Table 5 summarizes the recommendations of the working party on the staffing of the college. It should be noted that these did not include a change in the ratio of professors to readers or of senior lecturers to lecturers in order to conform to the established norms.

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[1] The working party realised that for a thorough study of student/staff ratios, problems such as class size, student/staff contact hours, and methods of instruction would have to be studied. However, the working party did not feel itself qualified to discuss these subjects. Nevertheless, bearing in mind the flexibility of all their norms, it was felt intuitively, and on the basis of current practice in some departments, that the proposed student/staff ratios could be achieved without radical change.

TABLE 5. Recommended changes in the student/staff ratios and consequent reduction in costs

	Student/staff ratios		
	1964/65 Actual	Recommended for 1970/71	Teacher cost saving per pupil (shs.)
Arts and social science	11.2:1	20:1	2 200
Agriculture	4.0:1	10.6:1	9 800
Education	15.7:1	20:1	1 900
Science	5.2:1	9.3:1	8 500
Medicine	5.3:1	10:1	6 000
Over-all	7.6:1	15:1	4 000

Although the increased student/staff ratios shown in table 5 could be considered very high for a British-type university (with seminars and tutorials as well as lectures) they did not in fact tell the whole story. Makerere, in common with many universities in developing regions, attracts many visiting teachers and research scholars who, though not on the establishment, do some teaching. The 1967 Manpower Survey illustrated this point with some force when it showed that whilst Makerere had a teaching establishment of 208, there were 300 people involved in some teaching.[1]

As far as the non-teaching costs were concerned, it was recommended that there should be no increase in administration expenditure over the plan period, even though student numbers were increasing rapidly, and only a 25 per cent increase in departmental non-teaching costs and library costs. The residential expenses at 2,500 shs. per student (equal to about five times the average per capita income of the country) were considered to be far too high. It was recommended that these expenses should be reduced by 25 per cent immediately basically through greater self-help by the students. These recommendations on non-teaching costs would have reduced the cost per student by 2,000 shs., giving a total reduction from 1964/65 to 1970/71 of 6,000 shs. per student (or 30 per cent).

After these various cuts the estimated recurrent cost per student of 14,000 shs. in 1970/71 (excluding personal allowances paid to students of 2,500 shs.) was still considered very high. Thus the working party turned its attention to the possibility of greater utilization of physical facilities and of teaching staff by running the university college for four terms a year instead of three.[2] By rotating students, with each attending three out of four terms, there could be a one-third increase in student numbers with only about a 13 per cent increase in total costs. Such a scheme, it appeared, could reduce costs to 11,900 shs. per student (excluding allowances), a reduction of 15 per cent. Admittedly, such reorganization would raise serious pedagogical and administrative problems, but it was thought that

[1] Ministry of Planning and Economic Development, *High-level manpower survey 1967 and analyses of requirement 1967–81*, Entebbe, Government Printer, 1968.

[2] See 'Uganda: educational cost evaluation', op. cit., where the potential for cost reduction through organizational changes is discussed at length.

the potential savings were so great that some such reorganization ought at least to be tried.[1]

2. *Capital costs*

An analysis of the current value of the buildings, land and other physical facilities used by Makerere University College estimated these to be worth about 100,000 shs. per student place, but recent expansion of the college had taken place at a capital cost of only 35,000 shs. per place. Of this amount, 17,000 shs. was accounted for by student residence facilities, and 18,000 shs. by teaching and staff housing facilities.

Under the working party's proposals, capital costs for future enrolment increases could be lower still. The recommended increase in the student/staff ratio would largely obviate the need for constructing additional staff housing. Existing teaching space could largely accommodate the proposed student expansion if capacity were more fully and efficiently used. It was further discovered that there were considerable possibilities for saving in student accommodation, by resorting to double occupancy of single rooms, by shift feeding and by other similar economy measures.

Taking all these factors into account, it was recommended that the expansion of 670 students planned for Makerere should take place at a capital cost of not more than 14,400 shs. per place. If the four term system were introduced, the capital costs could be even further reduced to an average of 8,000 shs. per place over the plan period.

B. Systems of financing

The working party also studied the implications of the present system of financing of the University of East Africa. (See appendix IV). This was done both with a view to discovering whether any one country was gaining particularly from this method of financing, and also in order to see whether a more rational method could be evolved.

As regards this first point it was discovered that under the present grant system there was some benefit to Uganda and loss to Kenya, i.e. Ugandans were receiving slightly more education than the Ugandan government was paying for directly and indirectly. It was also realized that if the three university colleges were immediately to become fully fledged and independent universities, there would be a considerable increase in university expenditure for the Uganda government (as non-Ugandan students would only be paying fees and there were more Kenyan and Tanzanian students at Makerere than Ugandans at the other two colleges). However, by 1969, when there would be enough qualified Ugandans to fill all places at Makerere, and with Kenya and Tanzania opening medical and agricultural faculties, it would have been in Uganda's financial interests to opt out of the University of East Africa.[1]

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[1] The working party was not arguing purely in favour of this particular proposal but for the principle that better use should be made of the existing facilities. The working party felt very strongly that a country at Uganda's level of development could little afford to construct expensive university facilities and then only use them for thirty weeks of the year.

The potential for considerably reducing the costs of university education could, however, be very great if through some new form of university organization the governments obtained greater control over university expenditures.

It was felt very strongly that whatever the future of the university, there should be more control over Makerere's expenditures. The working party thus recommended that the university college should presents its estimates in such a way that the information shown in table 2 would immediately be available. If this information were available, a more rational form of financing would be possible whereby the government paid for sponsored students on a *per student basis* with:

(a) grants to cover faculty expenses (differing from faculty to faculty);
(b) grants to cover administration and library expenses;
(c) grants for student living expenses.

In this way, the government would know exactly what it was paying for and would thus be able to refuse to pay for particular facilities that it thought too extravagant.

C. Government reaction to preliminary costing proposals

The governments main reaction to the sections of the report of the working party dealing with higher education was that the enrolments planned were not sufficient. The government therefore instructed the working party to reconvene and calculate the implications of a further 20 per cent increase in the intake of Ugandans into Makerere during the plan period 1966/67–1970/71.

The working party soon discovered that, because of the shortage of qualified secondary schools leavers, any such increase in the intake would have to be bunched towards the end of the plan period when more school leavers would become available. This meant that the total enrolments in Makerere toward the end of the plan period would need to be increased by considerably more than 20 per cent, i.e. from an originally planned 1,610 to 2,330 in 1970/71. This in turn had serious implications both for costs and for balancing university output with manpower requirements.

The working party considered that it had already taken full advantage of all potential economies of scale inherent in existing facilities and staff; thus the recurrent cost per pupil for the extra students could not be expected to fall below the 14,000 shs. originally calculated. This was especially the case since the government had recommended that most of the added increase in enrolments take place in the more expensive science faculties.

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[1] This analysis was made on the preliminary plans of the other two colleges, in which the cost per student was actually rising.

Similarly on the capital side, it was realized that under conventional organization most of the existing excess capacity, in both student and staff accommodation and in teaching facilities, would be used up with the originally planned expansion. Thus the proposed extra expansion would require substantial additions to physical plant and would cost considerably more per place than the figures previously used. Specifically, it was estimated that the extra enrolment could only take place at a cost of 30,000 shs. per place.

Table 6 summarizes the original and the revised capital and recurrent proposals of the working party.

TABLE 6. Original and revised capital and recurrent costs for the expansion of Makerere University College

		Recurrent 1970/71[1]		Increase in enrolment 1965/66-1970/71	Capital 1966/67-1970/71	
	Target enrolment	Per student (shs.)	Total (thousands of shillings)		Per place (shs.)	Total (thousands of shillings)
Original proposal	1 610	14 000	22.5	670	14 400	9.6
Revised proposal	2 330			1 390		
(a) extra places	720	14 000	10.1	720	30 000	21.6
(b) total	—	—	32.6	—	—	31.2

1. Excluding 2,500 shs. per annum personal allowances paid to students.

These revised figures—involving more than a threefold increase in capital expenditure on university expansion and almost a 50 per cent increase in recurrent expenditure—were accepted by the government,[1] even though the bunching of the added enrolment increase late in the *second* plan period meant producing 31 per cent more graduates than the manpower projections showed would be necessary during the *third* plan period (1971/72–1975/76). This was so even on the unlikely assumption that no further expansion of intakes would take place beyond 1971.[2]

D. University reaction to original and revised working party targets

The Registrar of Makerere was on the working party and was in agreement with the recommendations, but others at the university college evidently found little to recommend the various cost reducing proposals. In all events, when the college later presented its own triennial plan for 1967/68–1969/70 to the government, the university central office, and to the UGC, it bore little relationship, except in enrolment terms, to the working party's revised figures. We shall shortly return to this point.

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[1] Republic of Uganda, *Work for progress: Uganda's second five-year plan, 1966–71*, Entebbe, Government Printer, 1966.

[2] A subsequent manpower survey in 1967 showed that the original projections underestimated requirements and that the government was, therefore, quite justified in increasing enrolments.

III. The university and the planning of the three university colleges

Towards the end of 1966 the university central office prepared the first draft of the composite University Triennal Development Plan (1967/68–1969/70), incorporating the requirements of the three constituent colleges. This original draft was revised several times, but even the final version was substantially a consolidation of the separate requests of the three university colleges. Evidently no serious attempt had been made to evaluate the proposals of the colleges, to check their consistency, to examine their implicit costs in relation to their aims and likely effectiveness, or to seek out possible economies.

A. University Grants Committee 1967

This was the situation when the UGC met in March 1967 to decide on the recurrent financing of the university during the second triennium (1967/68–1969/70). The committee's membership included a representative from each of the three East African governments and the EACSO, and four academicians from outside East Africa, including the chairman.

The committee was presented with triennial estimates for each of three university colleges, the university development plan with estimates of enrolments of students by faculty over the triennium, and various estimates of recurrent expenditures.

Each college, it turned out, had drawn up its estimates in a different way. None had followed the normal government procedure of showing the last year's approved establishment and estimated expenditures under each head. Thus it was impossible to identify, except in global terms, where the increase in expenditure from the last year of the first triennium to the first year of the second triennium were going to go. The proposed over-all increase in expenditure for the first year of the triennium was over 50 per cent, and the potential economies of scale were ignored to such an extent that costs per student in each of the three colleges were forecast to rise, not fall. One set of estimates was internally inconsistent, with columns of figures added incorrectly and summary tables that in some respects disagreed with the detailed estimates which they summarized. Table 7 illustrates the magnitude of the problem which confronted the UGC.

After visiting each of the three colleges and having extensive discussions with administrators and faculties, the UGC was still unable either to reach satisfactory estimates of the expected student numbers or to understand or compare the triennial estimates of the respective colleges. It was therefore decided that the UGC should adjourn for four months to give the colleges time to prepare new estimates in a consistent form.

TABLE 7. Colleges' own estimates of student numbers and recurrent expenditure 1967/68 compared with actual 1966/67

	Undergraduate enrolment			Recurrent estimate. ('000 shs.)		
	1966/67 actual	1967/68 estimated	Percentage increase	1966/67 actual	1967/68 estimated	Percentage increase
Makerere	1 386	1 658	19.6	25 545	33 913	32.8
Nairobi	1 039	1 514	45.7	19 945	37 805	89.5
Dar-es-Salaam	675[1]	622[2]	7.9	13 016	16 474	26.6
TOTAL	3 100	3 794	22.4	58 506	88 192	50.7

1. Figure before expulsion of 300 students in 1966.
2. Figure assuming expelled students would not return.

Before adjourning, however, some tentative allocation had to be made for the first year of the triennium since the committee would not meet again until after the triennium had begun.[1] The student numbers for each college for 1967/68 were estimated from the enrolments in 1966/67 and the pending applications for admission in 1967/68 (it was assumed on past trends that 90 per cent of qualified applicants would in fact enter the university). The recurrent cost allocation was worked out on a rough rule of thumb basis. It was merely assumed that an increase in student numbers in a particular faculty should involve a marginal increase in the pupil/staff ratio and a marginal fall in the cost per student. At Dar-es-Salaam where there was a fall in student numbers, due to the expulsion of over 300 students, it was assumed that there should be no increase in costs or establishment except where the normal progression of students (from first to second year and from second to third) required the addition of new courses.

The recurrent and establishment provisions made by the UGC were in the nature of a temporary ceiling which could be revised upwards later if justified by the colleges in their detailed accurately drawn-up estimates.

The UGC also worked out in detail a standard estimate format to be followed by all three colleges (see appendix III) and set up a budget sub-committee (composed of the government and EASCO members of the committee) to assist the colleges in drawing up their triennial estimates on this form before the UGC met again.

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[1] *Interim report of the 1967 university grants committee*, Kampala, University of East Africa, 1967.

TABLE 8. Temporary ceiling allocations of UGC for year 1967/68 (thousands of shillings)

	Establishment		Student enrolment		Recurrent allocation	
	1966/67	1967/68	1966/67	1967/68	1966/67	1967/68
Makerere	194	209	1 386	1 582	25 544	28 800
Nairobi	134	173	1 039	1 358	19 944	28 000[1]
Dar-es-Salaam	79	82	675	622	13 016	13 400
TOTAL	407	464	3 100	3 562	58 504	70 200

[1] Includes an item for rent of 2 million shs. not in other estimates and not covered by university financing.

When the UGC did assemble again in August 1967 its task was reasonably straightforward because:

1. All estimates had been drawn up in the method advocated, thus it was possible to see exactly why the estimates were increasing from 1966/67–1967/68, and throughout the triennium. It was possible to compare the estimates of the different colleges line by line, to identify increases in establishment of both academic and ancillary staff, and to work out the progression of the faculty per student;
2. The governments and colleges had agreed on figures for the enrolment of students throughout the triennium.

The UGC then set to work, studying the estimates and seeing if they were consistent with accepted standards of economy.[1] (It did not study any radical methods of greater facility utilization such as the four-term system studied by the working party.)

Attention was first focused on the student/staff ratio in the common faculties. On the basis of an accepted teaching load of approximately nine hours a week contact time with students, it was possible to apply establishment norms for various types of departments (taking into account the minimum number of specializations, proportion of lectures, seminars and practical periods, etc.). Such norms, as noted earlier, had originally been formulated by the Economy Commission as a means of cutting the estimates of the three university colleges during the planning process for the first triennium. (The membership of the Economy Commission was made up entirely of local and foreign academics: there was no government representation.)

Table 9 shows the results of some of the UGC's calculations. The staffing standards were based on the number of full-time student equivalents (FTSE) in a department. A student taking one course in each of three departments, for example, was counted as ⅓ FTSE in each of them.

The second point to be examined was the ratio professors/senior lecturers and readers/lecturers, which in the long run was meant to approach 1:1:4. Then the salaries used in the estimates, had to be examined as these were established median norms for each category of academic staff.

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[1] *Report of the 1967 university grants committee*, Kampala, University of East Africa, 1967.

TABLE 9. Staffing norms for the common faculties

FTSE	Establishment	Staff/student ratio
Arts, social sciences and mathematics		
0– 30	3	0–10.0
30– 50	4	7.5–12.5
50– 65	5	10.0–13.0
65– 80	6	10.8–13.3
80–105	7	11.4–15.0
Botany and zoology		
0– 60	4	0–15.0
60– 80	5	12.0–16.0
80–100	6	13.3–16.6
Chemistry and physics		
0– 40	4	0–10.0
40– 60	5	8.0–12.0
60– 80	6	10.0–13.3

It was found that in virtually all cases the colleges were planning to increase their establishment of academic staff beyond the above norms even though they all had many supernumerary academic members who did not appear in the estimates, (e.g. visiting professors; research staff; supernumerary localization posts; part-time staff; staff supplied for specific purposes by aid donors and foundations; etc.). In most cases the establishment was reduced to the norm by the UGC. It was also found that the ratio of professors/senior lecturers and readers/lecturers was considerably off the norm, and in some cases more than the median salary for a particular category of staff had been included. In some cases the creation of new departments, and thus new senior posts, was not allowed in order to bring this norm into line.

The next step was to compare the ratio of teaching to non-teaching costs within each type of faculty at each of the colleges. Except for some discrepancies in special expenditures, there proved to be little difference among them. However, it was discovered that in the science faculties there was a disproportionate increase throughout the triennium in ancillary and technical staff, possibly in anticipation of stricter control on academic staff.

While the 'common faculties' were treated in the above fashion, for most of the 'professional faculties' there were existing recommendations by outside experts on staffing standards; as long as these were not exceeded the committee did not change the proposed establishments of these faculties. Although the UGC, lacking the necessary expertise, could hardly have done other than it did on this matter, various studies have shown that some of the more heavily staffed professional faculties did in fact work on a very low staff/student contact hours norm. For instance a USAID memorandum showed that in the veterinary faculty at Nairobi staff/student contact hours varied from 5.6 hours per week for 30 weeks of the year to 4.8 hours per week, considerably below the norm of 9 hours a week for the common faculties.[1] Less detailed study of other professional faculties showed that only in agriculture at Makerere, and law at Dar-es-Salaam, did the staff/student contact hours approach the norm for the common faculties.

The committee expressed some surprise, nevertheless, that the student/staff ratio in the veterinary faculty was only expected to rise to 5.4 in 1969/70, and suggested an investigation of why animal medicine was more expensive than human medicine.

In estimating recurrent costs the committee finally assumed that 4 per cent of posts would be unfilled at any one time.

The committee next turned to the non-faculty expenses and discovered that there were large differences between the colleges. At Nairobi 47.7 per cent of total estimated expenditure in 1967/68 went to various overheads, against only 37.9 per cent for Makerere in 1969/70.[2] There being no logical reason for such large differences, the committee attempted to reduce them. The differences appeared to be due to three main factors: (i) different rates of expenditure on maintenance at each of the three colleges (the UGC recommended that in all cases the maintenance expenditure be reduced); (ii) different types of insurance at the three colleges (the UGC recommended that these should be standardized); (iii) the inclusion of two millions shillings per annum for rent of staff houses at Nairobi, due to the fact that the Kenyan government, unlike the Ugandan and Tanzanian governments, had not provided its university college with sufficient capital finance for staff housing. (The UGC thus recommended that this two millions shillings a year should not be covered through university financing, but by the Kenyan government.)

Though the UGC explained why it made specific reductions in the college estimates, the colleges were in no way bound to reduce their estimates in exactly the same way. They were not allowed, however, to increase their over-all academic establishment beyond the figures recommended by the UGC, nor to spend more than the total approved by the UGC (once this amount had been approved by the governments). In short, the UGC set firm outside limits (if approved by the governments) but only provided guidance on allocations within these limits. Thus, for example, though the UGC might have reduced the over-all establishment of a certain college by *x* posts because it thought there were *x* posts too many in a certain department, the college was not obliged to reduce that department by *x* posts; it could, if it chose to, take these *x* posts from the establishments of other departments.

The UGC made allocations of established posts to each college, which on the basis of the estimated enrolments gave student/staff ratios as shown in table 10.

On the basis of these various considerations, the UGC made allocations to each

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[1] Department of State, unclassified, *University College Nairobi, Faculty of Veterinary Science*, Nairobi, Project 618-11-110-602, 1968.

[2] These 'overheads' excluded expenditure on halls of residence, which were not considered by the UGC since the 2,500 sh. student fee was presumed to defray all costs.

TABLE 10. Student enrolment, staff establishment and student/staff ratio set by the UGC

	Enrol.	1967/68 Estab.	Student/staff ratio[1]	Enrol.	1968/69 Estab.	Student/staff ratio	Enrol.	1969/70 Estab.	Student/staff ratio
Makerere	1 805	208	8.7	2 242	241	9.4	2 443	250	9.8
Nairobi	1 539	185	8.3	1 928	200	9.6	2 296	221	10.4
Dar-es-Salaam	987	92	10.7	1 292	107	12.1	1 542	118	13.1
TOTAL	4 331	485	8.9	5 462	548	10.0	6 281	589	10.7

[1] The differences in student/staff ratio between the colleges are largely due to the differing proportion of students in the expensive professional faculties.

TABLE 11. UGC allocations (thousands of shs.) and consequent cost per student (in shs.)

	1967/68		1968/69		1969/70	
	Allocation	Cost per student[1]	Allocation	Cost per student	Allocation	Cost per student
Makerere	28 260	15 660	30 620	13 660	3[illegible] 100	13 140
Nairobi	26 380	17 140	28 900	15 000	30 600	13 320
Dar-es-Salaam	15 320	15 520	16 920	13 100	17 860	11 600
TOTAL	69 960	16 160	76 440	14 000	80 [illegible]60	12 840

[1] These are not the total costs that had to be met by the government: there was also a residential charge of 2,500 shs. per annum; bursaries amounting to approximately another 2,500 shs. per annum; and the cost of the university central office (410 shs. per student in 1969/70).

college for each of the three years as shown in table 11. The allocations are also shown as cost per student.

Thus although the UGC cut the combined three college estimates for the three years from over 300 million shs. to under 230 million shs.—a cut of more than 23 per cent—the cost per student including residence and central administration in 1969/70 was likely to be 15,750 shs., compared with the 14,000 shs. thought reasonable by the working party for a smaller number of students in 1970/71.

The UGC then estimated the revenue of each of the three colleges from tuition and registration fees, rents and other income, and from this calculated the 'net requirements' to be met by government capitation grants and grants from the East African Community. The percentage of each college allocation appearing as net requirements is shown in table 12.

This table is particularly interesting because it shows that even though the *total* cost of each of the three colleges was rising, the *net requirements* portion (half of which was to be paid by the three governments and the other by the East African Community) was in fact falling. Specifically, the net requirements per sponsored student was projected to fall from approximately 13,500 shs. per student in 1965–66 to 10,500 shs. in 1967/68 and 7,000 shs. in 1969/70. Thus because of the falling unit costs, the tuition fees which were paid directly to the colleges, and which were fixed were covering an increasing proportion of the total cost. The pooled

TABLE 12. 'Net requirements': percentage of total UGC allocation for the three colleges coming from capitation grants and grants from the East African Community (thousands of shillings)

	Makerere	Nairobi	Dar-es-Salaam	Total
1967/68				
Allocation	28 260	26 380	15 320	69 960
'Net requirements'	16 800	16 100	9 160	42 060
Percentage	59.4	61.0	59.8	60.1
1968/69				
Allocation	30 620	28 900	16 920	76 440
'Net requirements'	16 340	16 100	8 920	41 360
Percentage	53.4	55.7	52.7	54.1
1969/70				
Allocation	32 100	30 600	17 860	80 560
'Net requirements'	16 440	15 780	8 380	40 600
Percentage	51.2	51.6	46.9	50.4

contributions, the 'net requirements', were becoming less and less important. Though the proportion of the net requirements met by the East African Community was rising, the proportion of total expenditure met by the community was in fact falling.

The UGC studied the central office expenditures and various priority projects in the colleges. As these were not financed in the same way as the ordinary college expenditures we will not deal with them here. The committee also made various recommendations of a general nature, two of which were of considerable importance for the future. These were:

1. For any deviation of more than 5 per cent in the estimated enrolment (on which the recurrent allocations were made) there should be an addition or deduction of 2,000 shs. per student from the net requirements. The government should also be given an early warning of the possibility of an increase more than 5 per cent over the figures on which the triennial estimates were based so that they could indicate their willingness or unwillingness to finance this increase;
2. To give a true picture of the activities of the university, all expenditure should be shown in the estimates and accounts, whether direct or indirect, and whether covered by UGC revenue or from outside sources.

As was mentioned earlier, although there were only 208 established posts at Makerere in 1967/68, in fact there were 300 people involved in some teaching. Because the extra ninety-two people were financed from outside UGC revenues and often were only engaged in part-time teaching, they appear nowhere in the estimates; thus from the estimate it is not possible to get a true idea of all the college's activities, nor a true idea of the potential for cost reduction.

B. Capital costs of university expansion

Whereas the university as a whole had its recurrent requirements financed on an East African basis, the capital requirements of each of the three university colleges was the sole responsibility of the respective governments. Thus this section will deal only with Makerere University College. However, although meeting the capital requirements of Makerere were clearly the responsibility of the Ugandan government, this did not mean that the government firmly controlled capital expenditures. Even though theoretically there were perhaps direct channels for governmental control, the control was at best indirect.

In preparing Uganda's Second Five-year Plan, civil servants in the Ministries of Planning and of Education held extensive discussions with Makerere on its capital requirements. Originally Makerere had asked for 56 million shs. over the plan period 1966/67–1970/71. The working party had recommended in its revised proposals that the college be allocated only 31.3 million shs. Finally an allocation of 40 million shs., worked out on a project basis, was agreed to by the government, although many, including a visiting World Bank mission, felt that this was more than could probably be implemented.

In October 1967, a conference held in Nairobi,[1] attended by all the major potential aid donors to the University of East Africa, received documents prepared by Makerere which included projects that had previously been set aside in the budget process as well as some additional ones, adding up to a total request for 64 million shs. from aid donors for the period 1967/68–1969/70. This compared with the 40 million shs. approved in the government plan for the period 1966/67–1970/71. In addition, the Makerere presentation included 30 million shs. in recurrent support, mainly for research, over and above the UGC recommended allocation.

In an effort to be fair both to Makerere and to the donors, the Ugandan government prepared and circulated to the conference participants a list of university projects ranked in order of priority. It included:

(a) *Key projects*, defined as projects that must go ahead if Makerere was to develop numerically as planned. (Included were some projects which, though not really of first priority, already had a virtually definite aid commitment.);

(b) *Other projects of high priority*, defined as those which, though not absolutely essential, were highly desirable;

(c) *Other projects*, defined as not essential for the normal functioning of the university, yet desirable for student welfare;

(d) *Projects requiring further study*, hence not ready for action by donors.

Table 13 shows the priority ranking of the various Makerere capital projects.

In the light of government priorities, the original Makerere request of 64 million shs. capital for the triennium was effectively reduced to 37.6 million shs.—priorities (a) and (b)—without causing ill feeling in any direction.

On the assumption that not all the priority (b) projects would get donor support, it seemed likely that the total development expenditure at Makerere during the Five-year Plan period (including those projects under construction) would in fact not exceed the 40 million shs. approved in the government plan.

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[1] See *The report of the conference on the University of East Africa*, Kampala, University of East Africa, 1967.

TABLE 13. Proposed Makerere capital projects for 1967/68 through 1969/70 (thousands of shillings)

(a) *Key projects*	
1. Student accommodation for 1,000 students	18 000
2. 84 staff housing units	7 400
3. Main library extension	3 300
4. Faculty of Agriculture extension	3 000
5. Faculty of Medicine extension	1 500
TOTAL (a)	33 200
(b) *Other projects of high priority*	
1. Arts and social science blocks	2 400
2. Institute of Education library	1 440
3. University bookshop	600
TOTAL (b)	4 440
(c) *Other projects*	
1. Students Union	3 000
2. Post-graduate and research flats	1 500
3. Sports facilities	1 500
4. Extension and improvement to college estates	600
TOTAL (c)	6 600
(d) *Projects requiring further study*	
1. Centre for continuing education	
2. Law school	
3. etc.	
GRAND TOTAL	44 240

NOTE This table does not include projects already under construction. In October 1967 these included: new maths.-science building, (3.6 million shs.) and staff housing (1.6 million shs.).

Thus at the end of October 1967, more than three months after the university triennium had begun, and fifteen months after the start of the Ugandan Second Five-year Plan, a plan for Makerere and the university could at last be said to have been agreed upon by all interested parties. Enrolment estimates had been settled, recurrent cost allocations had been made by the UGC and accepted by governments, and the Ugandan government had used, without serious friction, its ultimate authority to impose a capital ceiling on Makerere—whose true academic freedom apparently survived unimpaired.

It remained to be seen whether the agreed capital targets would in fact be implemented, particularly in view of delays in aid projects.[1] In late 1968 when the author left Uganda, it appeared likely that all the priority (a) and (b) projects would in fact be implemented during the plan period, with the possible exception of: (i) forty staff housing units; (ii) the Faculty of Agriculture extension (included under priority (a) only because USAID support had seemed certain, but which became doubtful because of the reduction of the USAID budget by Congress), and (iii) the arts and social science blocks. The foregoing would constitute a shortfall of 8.4 million shs. in the 40 million shs. projection. However, it also seemed likely that, in addition to the 1,000 hostel places for students, a further 250 would be built, increasing expenditures by 4.5 million shs. On balance, therefore, the total capital expenditure at Makerere over the plan period seemed likely to be almost exactly 40 million shs., the figure approved in the government plan.

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[1] It must be observed in all candour that extreme delays between the initiation of foreign aid proposals and their actual implementation (if at all) have been a major obstacle to effective planning of educational development. Large projects typically take at least three years from the initial proposal to completion, and some take as much as seven years—by which time needs and priorities may have shifted considerably. All parties are normally responsible in some way for the delays. Without intending criticism in any direction, we might cite, for example, a proposal for the construction of student residence facilities which was first put to USAID in 1964. Detailed

In retrospect the technique of priority analysis of projects appears to have been successful in fixing the capital expenditure of an organization which the government was responsible for, but over which it had no truly effective direct control.

IV. Conclusions

This study has examined the planning of the University of East Africa, and of Makerere University College in particular, in the period November 1964 to October 1968. In this period two major plans were produced for Makerere, the first as part of the education section of Uganda's Second Five-year Plan (1966/67-1970/71), the second as part of the University of East Africa's Second Triennial Development Plan (1967/68-1969/70). Not until October 1967, after both these planning periods had begun, were two planning processes merged and an acceptable plan settled.

The first plan, produced by the government's working party, was based on manpower projections and extensive cost analysis, but was not accepted by the university. One reason for this was that the government planners had worked independently and on the false assumption that the university, because it was largely government financed, could be planned in basically the same way as any other government educational establishment. Their plan was internally consistent

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proposals were not fully prepared and accepted until mid-1966. The preparation of physical plans did not begin until the middle of 1967. Construction had not started when the author left Uganda in October 1968, and appeared unlikely to be completed before the beginning of the academic year 1970/71, whereas the facilities were required for academic year 1968/69. During this long interval USAID policies changed somewhat and construction prices had risen in Uganda. Thus instead of a loan to cover 70 per cent of the cost of the facilities as earlier proposed, the final agreement provided a loan covering less than 50 per cent of a considerably increased total bill. Meanwhile the final agreement on assistance to the Faculty of Agriculture extensions, also applied for initially in 1964, had still to be signed.

and feasible and satisfied the government's main objectives of producing the needed high level manpower at not too high a cost, but it was not well received by the university college.

The second plan, produced by Makerere (and the other two university colleges in Kenya and Tanzania), also fulfilled the country's manpower objectives, but it aimed above all for academic excellence and gave much less attention to cost analysis and resource implications.

The UGC then had the difficult task of arriving at a compromise acceptable both to the governments of East Africa and to the university community. Using the results of the cost analyses worked out by the governments, certain academically accepted norms and college estimates drawn up in a revised and easily interpretable form, the UGC managed to make acceptable allocations. Shortly afterwards a donors conference was held at which the capital estimates were fixed.

However, because of the unclear lines of planning responsibility, the lack of consultation, and marked differences of concern over costs and national resource scarcities, the process had taken too long and the finally accepted plan came too late to be of maximum value. In this respect the lesson learnt from the relatively successful planning process for the first triennium seemed to have been lost. At that time a draft plan had been prepared and an aid donors conference held more than a year before the beginning of the triennium. This was followed by an economy commission which squeezed much of the 'water' out of the original estimates. Only then did a university grants committee meet to make final allocations, but still in time to give the colleges several months to plan their implementation.

For the second triennium there was no economy commission and no effective central university planning; the UGC was unable to make recommendations until after the beginning of the triennium, and the donors' conference was convened too late to be of maximum effect: the donors only confirmed aid already negociated.

Some of the useful lessons from this experience for other countries were summarized in the introduction to this paper: we turn our attention now to several others.

A. The value of cost analysis

A particularly encouraging lesson is that it is entirely feasible, even in developing countries where basic data is relatively scarce, to carry out a quite detailed cost analysis in conjuction with university planning. As we have seen, the working party was able to piece together sufficient data from various sources to provide an extensive breakdown of total unit costs per student, both capital and recurrent, by major components of recurrent costs, by departmental and programme sectors, and for different periods of time.

This detailed cost breakdown revealed a variety of specific opportunities for effecting cost reductions and provided a solid basis for projecting the future behaviour of costs under various sets of assumptions and options. In short, it opened up a wider range of operational choices for improving cost-effectiveness relationships within the university.

In particular the working party's cost analysis illustrated in measurable terms the potential economies of scale for Makerere and the whole University of East Africa which until then had been largely theoretical. But the analysis also revealed the limitations of such economies as enrolments approached the 'full capacity' of existing staff and facilities.

A particularly important lesson for other universities in this connexion is the distinction made between the present *average* cost per student and the future *marginal* (incremental) costs for additional students. Marginal costs may be either substantially lower or slightly higher than present average costs, depending upon how much flexibility there is for further expansion within existing capacity, and upon the costs involved in expanding this capacity. Universities are well advised to look hard at their marginal costs and their relation to marginal revenues in a period of expansion, and not to accept the easy but often fallacious assumption that costs per student will remain constant at their present level as more and more students are added.

This case study also demonstrates how specific changes in prevailing practices (such as a change in student/staff proportions in particular departments, or a modification in dormitory and feeding practices) can be 'costed' in order to test their probable impact on over-all requirements for faculty, facilities and finance. It is important to remember, however, that cost figures alone tell only part of the story; they must be related to corresponding educational results in order to judge the cost-effectiveness of any particular arrangement.

Perhaps the most important conclusion to be drawn is that no college or university can adequately plan its future without a fairly full understanding of its present cost structure and of how its costs are likely to behave in the future under alternative sets of circumstances. Only with such understanding can a university see its options clearly and make intelligent choices among them with a view to achieving the best educational results with the always limited resources available.

To maintain a clear picture of its costs, however, a university must establish a flow of basic information about itself, covering a certain minimum of items. The present case provides a useful checklist of some of these important items of information required for effective self-evaluation and planning.

B. Requirements for an effective planning process

The present case also shows, however, that even with a good supply of facts and with good technical analysis, the actual process of educational planning can go awry. In addition to adequate facts and competent analysis there must be clear lines of responsibility for planning and decision-making and close working relations at each stage among all the principal parties. This is especially urgent where the planning involves autonomous or semi-autonomous universities that are heavily dependent upon government finance. In such situations the government has a legitimate right to ensure that public funds are efficiently used and that all reasonable efforts are being made to meet priority public needs. On the other hand, the university has the right and duty to preserve sufficient autonomy to guarantee its intellectual freedom and to perform its various roles effectively. Clearly, therefore, government and university must both play a part in planning, but for this to work well there must be a clear division of labour and responsibility, and a clearly defined framework of goals, priorities and resource limitations to guide their respective planning.

There is no magic organizational formula, of course, to fit every case, or even any particular case. Without pretending to prescribe any such formula, however, one can suggest certain prerequisites for the type of situation under study here.

The university colleges themselves should have planning officers, conversant at least with simple cost evaluation and cost effectiveness techniques, and also aware of the development and planning priorities of the country in which their college is situated. Similarly, the planning section of the university central office must be sufficiently strong and well informed to be able to comment in detail on the plans prepared by the constituent colleges and to assist them where necessary in drawing up their plans.

Each of the sponsoring governments for its part would do well to have something like a permanent University Planning Committee composed of civil servants from the Ministries of education, finance, planning and possibility other agencies. Such a committee could maintain liaison on behalf of the whole government with the planning officers and committees of the local university college and could advise the Minister of education on university planning matters. It should not be expected, of course, that the government and university representatives would always see eye to eye, but by dealing with each other professionally, regularly, on the basis of common facts, they are far more likely to arrive at mutually acceptable solutions and to arrive there in ample time, than by operating separately in sealed compartments in an atmosphere of mutual distrust.

In a federal university situation, as in East Africa, it would seem good sense, prior to any over-all university planning confrontations (such as a meeting of the UGC or a donors conference), for the planning committees of the three governments to meet together with the central university planners in order to hammer out a consistent policy and an agreed general position.

Under the foregoing arrangements, each university college, in consultation with the government Planning Committee, would prepare its own plans in the first instance, consistent with government objectives. The plans of the separate colleges would then be combined and amended as necessary by the university central office, then discussed and again revised in consultation with the three government committees. Only then would the matter come before the UGC or a donors conference.

Actually an organizational structure somewhat along the above lines was beginning to appear in Uganda as of 1968. Early that year Makerere University College established a planning committee which included among its members representatives from the Ministries of education, finance and planning. It was already the accepted custom in Uganda that the Permanent Secretary of the Ministry of education in his capacity as government representative on the UGC would invite representatives from the Ministries of finance and planning to attend all meetings with him. All this seemed a good indication that the important lessons—both positive and negative—from the experience described in this report would be put to good use in the next round of university planning in East Africa, even though the University of East Africa itself is likely to be changing its character considerably in the meantime.

Appendix I

Student enrolment at the three university colleges of the University of East Africa 1964/65 to 1969/70

	1964/65	1965/66	1966/67	1967/68	1968/69 estimate	1969/70 estimate
Makerere	1 331	1 364	1 717	1 805	2 242	2 443
Nairobi	635	921	1 179	1 539	1 928	2 296
Dar-es-Salaam	210	523	699	987	1 292	1 542
TOTAL	2 176	2 808	3 595	4 331	5 462	6 281

NOTE Including all students at each of the respective university colleges, even those pursuing sub-degree-level courses, and part-time post-graduates. The figures do not therefore agree with those in table 3, p. 114 which refer to full-time undergraduate and post-graduate students.

Appendix II

Financing the University of East Africa (July 1967)

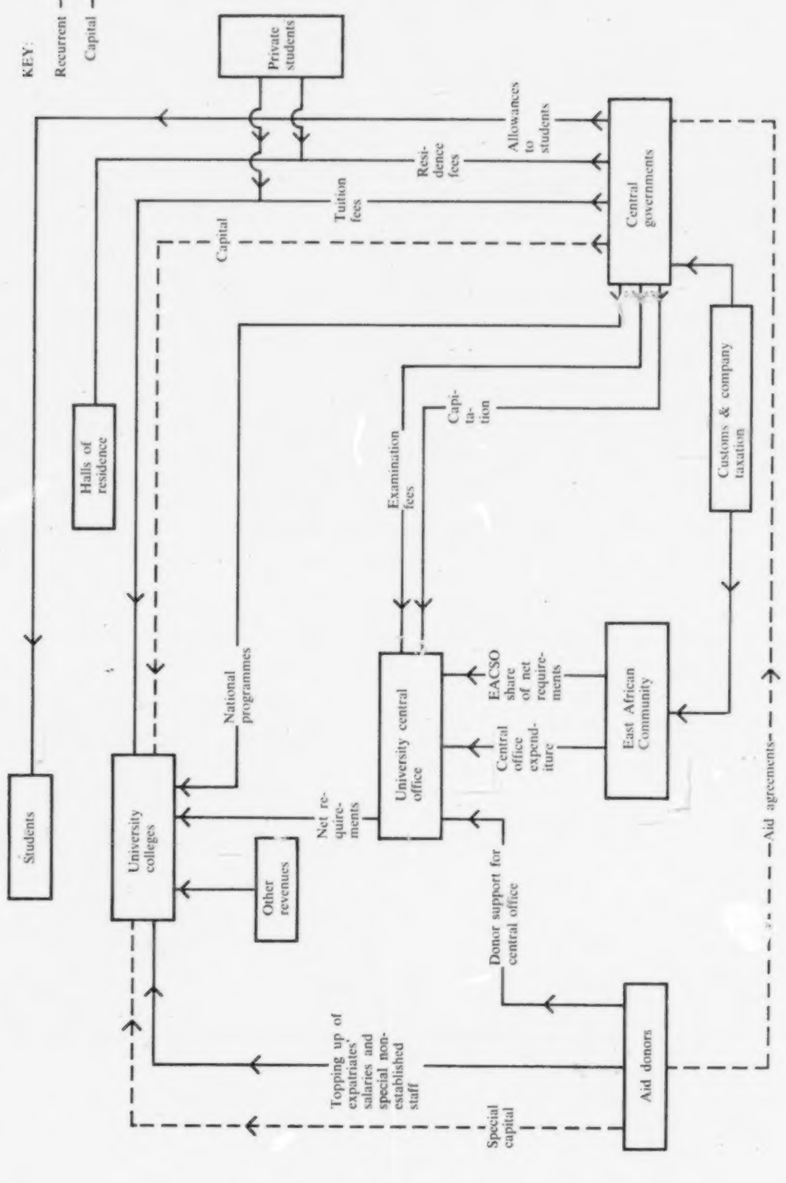
The sources and flow of financing for the university are shown in the diagram opposite, to which the following notes apply:

Net requirements. After the total recurrent requirements have been approved on a triennial basis by the UGC all the normal revenues (tuition fees, revenues from sales and investments, etc.) are subtracted and the remainder, called 'Net requirements', is financed jointly by governments in the form of a capitation grant and by the East African Community (formerly EACSO) on an agreed formula.

Capital. Each government is responsible for capital development at its college. Loans from foreign governments go through the relevant East African government, while grants go direct to colleges.

National programmes. Some programmes at the university colleges are not university but national programmes and are financed directly by the respective governments.

21. Uganda: III


KEY:
Recurrent
Capital
Private students
Students
Halls of residence
University colleges
Other revenues
University central office
East African Community
Customs & company taxation
Central governments
Aid donors
Allowances to students
Residence fees
Tuition fees
Capital
National programmes
Examination fees
Capitation
EACSO share of net requirements
Central office expenditure
Net requirements
Donor support for central office
Aid agreements
Topping up of expatriates' salaries and special non-established staff
Special capital

Appendix III

College estimates, as proposed by the University Grants Committee

As explained in the text, the UGC designed a standard procedure for presenting recurrent cost estimates and expenditures of the three colleges. The instructions issued are reproduced below.

Classification of expenditure : Personal emoluments

All staff are to be provided for in the appropriate following classifications:

(a) Academic posts

1. Principals and all established, supernumerary, temporary, or special, full-time teaching or research posts, regardless of whether or not they are a charge to the college.

(b) Other senior administrative and support posts

1. Full-time deans, registrars, bursars/finance officers, librarians, estate officers, wardens, demonstrators and graduate assistants.
2. All technical staff of and above the rank of technician.
3. All college and faculty administrative staff in the assistant lecturer scale or above, not provided for elsewhere.

(c) Ancillary staff

1. All secretaries, clerical staff, junior technicians, artisans, junior staff, subordinate staff, messengers, labourers and staff not provided for in another category.

N.B. All personnel engaged full time in university activities are to be provided for in one of the above categories.
No post may be divided between classifications for census or budget purposes.
Part-time staff are to be provided for in the appropriate category, but only the emoluments and not the staff numbers are to be shown.
In the case of staff not paid for from college funds the posts is to be shown but not the financial provision.

The personal emoluments vote is to provide for the following under the appropriate staff category:

2. Salaries.
3. Wages (including all casual labour charges for estate maintenance, etc.).
4. Overtime allowances where appropriate.
5. Acting allowances.
6. Duty allowances.
7. Provident Fund contributions.
8. Leave pay.
9. Personal allowances.
10. Personal pensionable allowances.
11. FSSU contributions (insurance).
12. Gratuities.

13. Pension contributions.
14. Education allowances where applicable for expatriate staff only.

Other charges expenditure

All other charges expenditure is to be provided for within the following categories. No personal emoluments or wages are to be charged to these votes.

(d) Passages

1. Leave passages and passages on first appointment or retirement.
2. Baggage allowances and incidental expenses arising from the above.
3. Payment in respect of a passage where an officer is authorized to make his own arrangements.
4. All rail and air fares (including airport taxes), freight charges, carriage and handling charges on baggage in East Africa in respect of officers entitled to overseas leave.

N.B. No expenditure is to be charged to this vote for duty or conference travel.

(e) Travelling expenses inside East Africa

1. Mileage allowances.
2. Subsistence allowances (hotel meals, etc.).
3. Bicycle allowances.
4. All rail and air fares, freight charges, carriage and handling charges on staff members' baggage in East Africa (other than those arising from overseas leave privileges).
5. Travelling expenses for medical examination or interview on first appointment.
6. Airport taxes when travelling on duty.
7. Cost of hired transport.
8. Minor incidental expenses connected with travel.

(f) Travelling expenses outside East Africa

All expenditure for travel and allowances arising from attending conferences, meetings, or travel on duty outside East Africa and to include:

1. Passages.
2. Air fares.
3. Taxi or car hire.
4. Hotel expenses.
5. Relevant incidental expenses such as telephone calls, airport taxes, etc.

(g) Office expenses

1. All expendable and consumable stores required for an office.
2. Printing of stationery, forms, departmental annual reports, etc.
3. Repairs and maintenance of office equipment.
4. Periodicals, journals and bookbinding, purchases and maintenance of books.
5. Hire of office machinery and equipment.
6. Postal services: telephone calls and rentals, telegrams and cables, telegraph address charges, private box and bag rentals.
7. Printing of publications.

N.B. Expenditure incurred by libraries is not to be charged to this vote.

(h) Consumable stores and minor equipment

1. Expenditure on consumable stores (other than for office use).
2. Minor equipment not exceeding 1,000 shs. in cost per unit, not provided for elsewhere.
3. Minor laboratory equipment.
4. Rations.
5. Machinery and equipment rentals (other than for office use).
6. Cleaning materials.
7. Purchase and upkeep of uniforms.
8. Purchase, feeding and upkeep of laboratory animals.

N.B. Any materials, stores, or equipment for estate maintenance are not to be purchased from this vote.

(i) Miscellaneous other charges

1. Medical capitation fees.
2. Medical examination fees on first appointment.
3. Reimbursement of hospital expenses.
4. Legal and consultants' fees.
5. Fees and rewards.
6. Training courses and fees.
7. Advertising expenses.
8. Subscriptions (other than for periodicals and journals).
9. Entertainment expenses when authorized.
10. Personal accident insurance (flying).
11. Audit services.
12. Expenses of conferences not provided for elsewhere.

(j) Maintenance and upkeep of buildings and estates

1. Rent and rates other than for rented staff quarters.
2. Maintenance of all university and college buildings and estates including all expendable and consumable stores required for such maintenance.
3. Minor improvements to buildings and estates where the expenditure for the project does not exceed 5,000 shs.
4. Insurances.
5. Water, electricity and conservancy charges.

(k) Special expenditure

All items of a non-recurrent nature but for which provision is not made in the capital budget of the university or college, e.g.

1. Vehicles.
2. Typewriters.
3. Items of equipment exceeding 1,000 shs. per unit.
4. Building improvements exceeding 5,000 shs. for the project.
5. Calculating machines.
6. Duplicating machines.

N.B. Any single item of special expenditure on which it is proposed to spend more than 40,000 shs. is to be provided for in the capital programme.

(l) Libraries

1. All expenditure incurred on purchase, maintenance and binding of books, periodicals, journals and papers for a library.

(m) Rents

1. Rent of staff quarters including expenses of leases and where applicable upkeep and maintenance of leased houses.

No variations of the classification of expenditure are to be made without the approval of the central office, when any such variations or additions will apply to all colleges.

The estimates of expenditure are to be prepared in accordance with the classification of expenditure and on the proper form, for each department. Departmental estimates are to be collated to provide an overall estimate for a faculty or administrative office.

Footnotes are to be given in the estimates to explain all but minor changes in provisions.

Special expenditure is to be used as a heading with the details of the items to be purchased, and the estimate of the cost of each item or project.

Appendix IV

Financing the University of East Africa.
The effects of various intergovernmental financial flow possibilities.[1]

Before alternative proposals for financing the University of East Africa can be posited it would be useful to analyse the subsidization effects of the present system. Figures for 1965 will be used throughout. In that year the student enrolment was as given in table 1, and the university colleges received their revenues from the sources given in table 2.

TABLE 1. Student enrolment by nationality and of college 1965/66

	Ugandan	Kenyan	Tanzanian	Other	Total
Makerere	645	270	198	147	1 260
Nairobi	189	474	189	69	921
Dar-es-Salaam	54	83	353	33	523
TOTAL	888	827	740	249	2 704

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[1] Throughout this appendix we will be dealing only with those expenditures *controlled* by the university colleges. Allowances to students, residential expenses for students, central university administration, and direct payment of staff by aid donors *are not* included.

TABLE 2. Financing the University of East Africa: estimate for 1965/66[1]

	Thousands of shillings	Percentage
Fees (government students)	14 730	28.5
Fees (private students)	1 494	2.9
Capitation (government)	19 198	37.1
EACSO	13 895	26.8
Other revenues	2 455	4.7
TOTAL	51 772	100.0

[1] This table is based on table 1, p. 112 but including revenues received from private students.

It can be seen from table 2 that 26.8 per cent of the university colleges' revenues came from EACSO, which in turn obtained its revenues from company taxation and import duties according to an agreed formula. It has been estimated that 50 per cent of EACSO's revenues originated from Kenya, 25 per cent from Tanzania and 25 per cent from Uganda. Assuming that the EACSO revenues would have been redistributed according to this estimate, table 3 shows the total cost of university finance to each government.

TABLE 3. Total cost of the University of East Africa to each government assuming redistribution of EACSO revenues (thousands of shillings)

	Fees	Capitation	EACSO	Other	Total
Uganda	5 328	6 944	3 474	—	15 746
Kenya	4 962	6 467	6 948	—	18 377
Tanzania	4 440	5 787	3 473	—	13 700
Other	1 494	—	—	2 455	3 949
TOTAL	16 224	19 198	13 895	2 455	51 772

Thus, using the enrolment figures from table 1, in 1965/66 Uganda could be said to be paying 17,730 shs. per student per year, Kenya 22,220 shs., and Tanzania 18,510 shs.

However, these differences do not necessarily mean that one government is subsidizing another. If for instance a larger proportion of Kenyans than of Tanzanians or Ugandans were studying in the expensive professional faculties, one would expect the cost to Kenya to be higher.

Let us therefore assume the following cost weighting, the overall recurrent cost per capita being 1.0.

1. B.A., B.Sc. (Econ.), B.Com., B. Ed., all diplomas except for those in engineering and architecture, and all postgraduate studies in arts, African studies and education: 0.7.
2. Law: 1.0.
3. All professional and science faculties: 1.4.

Table 4 shows the number of students by country of origin and cost weighting.

TABLE 4. Distribution of students by nationality and faculty weighting

Weighting	Ugandan	Kenyan	Tanzanian
0.7	467	418	418
1.0	39	47	62
1.4	382	362	260
Total weighted cost	900.7	846.4	718.6
Av. weighting per student	1.01	1.02	0.97

Thus assuming that each country ought to pay for what it is receiving, Uganda ought to pay $\frac{1.01 \times 888}{2455}$ of the total cost met by the governments, Kenya $\frac{1.02 \times 827}{2455}$ of the total cost and Tanzania $\frac{0.97 \times 740}{2455}$ of the total cost.

Table 5 shows, on the basis of the above arguments, the cross subsidization between the three East African governments.

TABLE 5. Subsidization due to present financing arrangements—assuming distribution of EACSO revenues (thousands of shillings)

	Uganda	Kenya	Tanzania
Amount paid	15 746	18 377	13 700
Amount that should be paid	17 456	16 403	13 964
Subsidization +	+ 1 710	− 1 974	+ 264

Thus under the present system of financing the university, Uganda gains considerably, Kenya loses, whilst Tanzania gets roughly what she is paying for.

However, if one considers the uneven distribution of the EACSO financing as an entirely separate exercise, i.e. as a counterweight to the uneven benefits of the common market then the position is quite different.

Table 6 shows the amount paid by the three East African governments, excluding the EACSO payments, the amount that should be paid excluding the EACSO share, and the subsidization from one college to another.

TABLE 6. Subsidization due to present financing arrangements—ignoring EACSO revenue sources (thousands of shillings)

	Uganda	Kenya	Tanzania
Amount paid	12 272	11 429	10 227
Amount that should be paid	12 384	11 637	9 907
Subsidization	+ 112	+ 208	− 320

Thus, leaving out the transfer effects, one finds that Tanzania is to a small extent paying for Ugandan and Kenyan students.

Changes in the system of university financing

It is accepted that the University of East Africa will have ceased to exist in its present form after July 1970. In this exercise, however, it is the effects of different methods of financing for 1965/66 that are being calculated. The results of these calculations might be useful in formulating a new method of financing after 1970.

We will show the effects of two possible methods of financing, one very simple, and the other aiming to fulfil certain generally held objectives.

Firstly we will assume an end of regional co-operation, with each university college being financed directly by the local government, and students from the other East African countries paying only 6,000 shs. per annum fees. Table 7 shows the result of the above assumptions.

TABLE 7. Cost to the governments if three university colleges become full universities 1965/66 (thousands of shillings)

	Makerere (Ugandan govt.)	Nairobi (Kenyan govt.)	Dar-es-Salaam (Tanzanian govt.)
Total cost	21 193	19 504	11 075
Other revenues	600	1 200	655
Fees from other govts. and private students	3 685	2 682	1 014
Total to be met by govts.	16 908	15 622	9 406
Fees to other govts.	1 454	2 118	3 215
Total cost to govts.	18 362	17 740	11 721
Old total cost from table 3	15 746	18 377	13 700
Gain +	− 2 616	+ 637	+ 1 979

Thus if the university had broken up, and the only income each college got from the other governments was fee income, the expenditure of the Ugandan government on university education would have increased considerably, that of the Tanzanian government fallen considerably and that of the Kenyan government fallen slightly.

However, this is due to the fact that there were in 1965/66 many more Kenyans and Tanzanians studying at Makerere than Ugandans at the other two colleges. In 1970, with all three colleges approaching the same size, and with the numbers of students from each country studying in institutions in the other two countries being the same, these large gains and losses will have disappeared.

For an alternative method of financing let us assume that such a system should:
1. Allow greater control by governments of the expenditures in the local university.
2. Encourage governments to send students to universities in the other countries.
3. Enable universities to enrol a certain proportion of students from countries outside East Africa.
4. Not involve any large degree of subsidization from one country to another.

Thus each college, though directly controlled by the local government, should continue to have an East African student body and also some students from outside East Africa.

Each college would therefore work out their estimates before each academic year in the form shown in appendix III. These estimates would be summarized in the following way:

TABLE 8. Approximate expenditures and revenues under possible new method of financing the three university colleges 1965/66 figures (thousands of shillings)

	Revenues for			Expenditure by				
	Makerere	Nairobi	Dar-es-Salaam	Uganda	Kenya	Tanzania	EACSO	Other
Total cost	21 193	19 504	11 075	—	—	—	—	—
Adm. grant on per student bases from other 2 govts.	2 643	2 688	974	1 728	2 115	2 462	—	—
25 % of per student faculty cost from other 2 govts.	1 307	1 329	482	854	1 046	1 218	—	—
75 % of student fac. cost of non-citizens	3 921	3 988	1 446	—	—	—	9 355	—
Fees by private students	882	414	198	—	—	—	—	1 494
Remaining cost of private students	1 591	1 047	501	—	—	—	3 139	—
Foreign & other	600	1 200	655	—	—	—	—	2 455
Total non-host govtl. revenue	10 944	10 666	4 256	2 582	3 161	3 680	12 494	3 949
Total to be met by host govts.	10 249	8 838	6 819	10 249	8 838	6 819	—	—
Total exps.	—	—	—	12 831	11 999	10 499	12 494	3 949
Total exps. under present system	—	—	—	12 272	11 429	10 227	13 895	3 949
Gain +	—	—	—	−559	−570	−272	+1 401	—

Total administrative expenditure and miscellaneous costs . . . shs.
Cost per student . . . . shs.
Total Faculty of Arts and Social Science costs . . . shs.
Cost per student . . . . shs.
Total Faculty of Medecine costs . . . shs.
Cost per student . . . . shs.

They would be approved or rejected by the local government, in the same way as ordinary government estimates.

The cost per student for each East African student studying in a college other than the one in his country, and each foreign student, would be worked out (and would vary depending on the courses which he was taking). EACSO would then pay:

(a) 75 per cent of the faculty costs of East African students sponsored by governments, not studying in their own country (in order to encourage some students from other countries in the region to study abroad).

(b) the difference between the cost to the colleges of private students, and the fees (6,000 shs.) charged by the colleges (in order to enable the colleges to enrol some foreign students—these would obviously be the first to suffer if there were a budgetary crisis in one country and cuts had to be made. Thus their cost should be taken up by a more international body).

Table 8 shows the implications of such a method of financing, using 1965/66 figures.

The method of financing outlined above is of course only one of many possibilities. The important points of the scheme, however, are:

(a) The regional body of EACSO (now the East African Community) would concentrate its efforts on ensuring that the university colleges continued to take students from East African countries, other than their own, and from further afield.

(b) Each government would have complete financial control over the local university.

(c) Each university would present its accounts in an easily interpretable form so that governments would know exactly what they were paying for.

Appendix V

Problems of financing international projects. The example of the proposal for the establishment of a forestry department at Makerere University College

There are no facilities for training forestry graduates in the whole of East and Central Africa. The United Nations Food and Agricultural Organization (FAO), therefore, suggested that a forestry department be established at Makerere to cater for the whole of the region (Ethiopia, Sudan, Kenya, Uganda, Tanzania, Malawi and Zambia).

On the basis of manpower projections in some of the countries, and an independent assessment by FAO it was estimated that an intake of sixteen students a year from the region into the forestry department would meet the manpower requirements for professional foresters. The enrolment progression planned was as shown in table 1.

TABLE 1. Enrolment projections of proposed forestry department

First year	Second year	Third year	Qualifiers	Total enrolment
16	14	12	10–11	42

In the original United Nations Special Fund (UNSF) proposal the capital cost to be borne by the Ugandan government was 4,120,000 shs. on buildings and equipment and 760,000 shs. on student accommodation, a total of 4.9 million shillings. Assuming that the social rate of return for capital in Uganda is 6 per cent and that the capital should be written off over a period of thirty years this would involve a capital charge of 360,000 shs. per annum attributable to the department.

On the recurrent cost side it was assumed that the first year forestry students would participate in the normal programme of the Faculty of Agriculture. The marginal faculty cost in the Faculty of Agriculture was assumed to be 16,000 shs. per student per year. The expense of running the department when fully operating was assumed to be 620,000 shs. a year. To be added to these departmental and faculty expenses are the university overheads of approximately 6,000 shs. per year and the student residence expenses of 2,500 shs. per student per year. Table 2 summarizes the total cost implications of the department.

TABLE 2. Costs of proposed forestry department

	No. of students	Capital expressed as an annual payment	Recurrent per year	Total annual cost
(a) Capital				
4,880,000 shs.		360 000	—	—
(b) Recurrent				
(i) 1st Year at 16,000 shs. p.a. faculty cost.	16	—	256 000	—
(ii) 2nd & 3rd Years	28	—	620 000	—
(iii) University overheads at 6,000 shs. per student	42	—	252 000	—
(iv) Residence at 2,500 shs. per student	42	—	105 000	—
TOTAL ANNUAL COST		360 000	1 233 000	1 593 000

Thus, the average cost per student per year, including a capital element was 37,930 shs. and the average total cost per qualifier approximately 150,000 shs. (for the three years).

Though these figures are very high they do not show the true picture of the cost per student to the Ugandan government. Of the total output of ten or eleven students per year only two were required by Uganda. As this project was likely to fall outside the normal structure of the University of East Africa the only revenue received from non-Ugandan students would be 6,000 shs. tuition fee, and 2,500 shs. residence fee, a total of 8,500 shs. per student per year. Thirty-four of forty-two students enrolled would be non-Ugandans, and the revenue received from these students would be only 289,000 shs. Thus, the remaining 1.3 million shs. (1,593,000 - 289,000 shs.) would have to be met by the Ugandan government.

For this 1.3 million shs. Uganda would be receiving two qualified graduates a year, a cost per qualifier of 652,000 shs.

In the unlikely event that a foreign scholarship was not available, it would only cost the Ugandan government 60,000 shs. to train a qualified forestry graduate overseas, i.e. one tenth of the above cost.

Admittedly, the proposals outlined in the appendix were somewhat ambitious. These were re-worked with Norwegian Aid Agency (NORAD) assistance, and on the assumption that NORAD would supply the capital, it was found that the cost per student per year could be reduced to about 20,000 shs. inclusive of university overheads and residential expenses.

However, even with this very low cost per student (low for a professional department such as forestry), the cost per qualifier to the Ugandan government would still be 300,000 shs., five times the cost of obtaining the same qualifier from overseas.

The reason for this exceptionally high cost per qualifier is that an international project was being planned, serving a large region without parallel proposals for international financing.

Regional projects are, of course, very desirable for an area as a whole, but unless schemes for international financing of projects are applied, they can have very serious financial implications on the country in which they are situated.

It is, however, unlikely that countries being served by a regional institution not situated in their country, would be prepared to pay more than the fees that they would pay to send a student overseas. Thus the problem would perhaps only be overcome if an international fund were established to take up part of the cost of the regional projects.

United Kingdom *22*

The use of cost analysis to improve the efficiency of school building in England and Wales

prepared by Maureen Woodhall

Miss Maureen Woodhall, an IIEP staff member, in preparing this case-study has taken advantage of comments and suggestions made by numerous organizations including the Department of education and science in London. The IIEP acknowledges also comments made by Guy Oddie of the University of Edinburgh and John Beynon, Chief, Educational Buildings Section, Department of Planning and Financing of Education, Unesco, Paris.

Introduction

After the Second World War the Ministry of education and the 146 local education authorities (LEAs) in England and Wales[1] faced an urgent problem. The rise in the birth-rate immediately after the war meant an increase in the size of the school population, and the reform of the education system envisaged by the 1944 Education Act, particularly the decision to raise the minimum school-leaving age from 14 to 15 made new demands on school facilities. In addition over 5,000, or between one-fifth and one-sixth, of the existing school buildings had been damaged during the war, and there had been considerable shifts of the population between regions. All this called for an immediate and massive school-building programme.

Because of the war no new school buildings had been started for several years, yet between 1946 and 1949 the school population had increased from 5,100,000 to 5,700,000. Since then the school population has continued to increase, though less rapidly; between 1949 and 1956 there was an increase from 5.7 to 6.6 million, and in the following 10 years it increased again to 7.2 million. Moreover, the number of new school places that were needed was greater than the population increase suggested. As a result of war-time and postwar migration, new towns were developing which needed new schools.

At the same time the post-war economy was beset by severe shortages of resources. The building industry itself had been disrupted by the war, and there were many other urgent demands for new buildings competing with education's. The situation thus demanded a new approach to school building, and emphasized the need to improve efficiency and to secure the best value for money.

It is now over twenty years since the post-war crisis in school building emerged in Britain, and it is therefore possible to analyse both the problem and its solution. The solutions adopted have been highly successful. Between 1946 and 1966 over four million new school places were provided at a cost of about £1,000 million. [2]At the same time considerable economies were achieved, in the absence of which this number of new schools could not have been built without imposing a much heavier burden on the country's resources and forcing cuts in other items of educational expenditure.

Despite this record volume of school construction, however, much still remains to be done. In 1966 it was estimated that a further £1,000 million would be needed to eliminate overcrowding and to bring all existing school buildings to current standards.[3]

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1. The Ministry of education, (and the Department of education and science as it was later called) is responsible for education in England and Wales. Most of the research described in this case study, and the statistics, refer therefore to England and Wales. However, most of the techniques described have been applied on a smaller scale in Scotland.

2. Exchange rate 1969: £ 1 = US$ 2.40.

3. See: United Kingdom, Department of Education and Science, *Children and their primary schools; a report of the Central Advisory Council for Education (England)* (Plowden Report), London, HMSO, 1967, Volumes 1 and 2.

The gains in efficiency were the result of several factors and policies working together. To analyse the experience fully would require a detailed examination of the contribution of architectural, technical, economic and administrative factors. Although it is impossible to separate these factors completely, this case study is particularly concerned with the role of cost analysis in improving the efficiency of school building, taking 'cost analysis' in its widest sense to include *study* of costs, *analysis* of the determinants and components of cost, and *planning and control* of costs.

The British school-building experience will be described and analysed to illustrate to educational planners, administrators and economists the contribution of research and analysis of costs to raising efficiency in the educational sector. Lessons will be drawn from this experience that relate not only to the building of physical facilities but to other areas of decision-making in education.

I. The Education Act of 1944

In addition to re-organizing the structure of education in the United Kingdom, the administrative framework within which decisions on school building were to be made was laid down in the 1944 Education Act.[1] It required each local education authority to estimate the immediate and prospective needs of the area regarding primary and secondary education, and to prepare and submit to the Ministry a development plan. These development plans allowed a nation-wide building programme to be drawn up, based on local needs and short-term and long-term priorities. Another innovation gave to the Minister the duty of prescribing minimum standards for all new primary and secondary schools. Before the Act, there had been a number of handbooks of suggestions which provided a general statement of principles for planning school buildings, but these set no minimum standards and had no statutory status. These two clauses of the Act therefore laid the foundations for what was to be the essential feature of post-war building programmes: co-operation between local authorities and the Ministry of education.

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[1] The 1944 Education Act is discussed in any standard history of British education, and summarized in J. Stuart Maclure, *Educational Documents; England and Wales 1816–1963*, London, Chapman and Hall, 1965.

II. The institutional framework

The first major institutional innovation was the setting up of a special Architects and Buildings branch in the Ministry of education. But merely establishing a new department did not ensure its success. What was important in the new branch was the decision to form a development group which, as the name implies, would be active in the development work, as well as research. The group consisted of teams, including not only architects and surveyors but educational specialists and administrators, which actually designed a number of 'development projects'—schools built for particular local education authorities at their request and subject to the same conditions and controls as other local authority projects. This made it possible 'to try out new forms of design for schools based on changes in the educational requirements and in teaching techniques; to develop, in collaboration with the manufacturers and others, building methods, components and techniques which promise to make a valuable contribution to school building; and to study the application to school building of knowledge resulting from research into buildings and materials'.[1]

Thus, from its beginning, the development group acquired practical and technical experience, rather than simply acting as advisors for those engaged in practical design. Each team acted in much the same way as a group of private architects, complying with the prevailing regulations governing costs and standards. The main difference was that they were free to devote more time and, especially, more research effort to the problem than the average local authority team. The Ministry was determined from the outset to leave plenty of scope for local initiative and variation; this has meant that there has been no question of the Ministry designing 'model schools', or issuing instructions, apart from cost limits and minimum standards. But in order for the Ministry's research and development work to have an impact, the results needed to be well disseminated. Thus the Ministry published (and still publishes) a series of *Building Bulletins* which provide technical information on new building techniques, methodologies for cost or plan analysis, technical summaries of all the development projects, and information about other projects involving some kind of innovation. Since 1949 the Ministry has produced more than 40 such bulletins, which are widely used by local authorities.[2]

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[1] United Kingdom, Ministry of education, *The story of post-war building*, London, HMSO, 1957.

[2] The Department also appointed a number of territorial architects whose job it was to maintain liaison with local authorities, keep them abreast of current innovations, and transmit back to the central department local responses and local problems.

III. Initial investigations of building costs

One of the first actions of the new Architects and Buildings branch was to initiate research into the costs of school building. A simple comparison of the costs of new schools revealed considerable variation among local authorities. Costs per square foot ranged from 42s. to 78s.9d. for primary schools, and from 43s.9d. to about 68s.5d. for secondary schools. The question was how to explain these variations. The most obvious cause was the differences in physical characteristics of building sites, which affected the costs of land preparation. It seemed logical and useful, therefore, to distinguish between the costs over which local authorities had considerable control (that is, the costs of the buildings themselves), and the costs which were largely determined by the physical environment. Thus, the Ministry introduced the concepts of *net cost* per school place (the cost of buildings themselves, together with built-in furniture and fittings), and *gross cost* (defined as net cost plus the *additional cost* per place for site preparation and installations, such as costs of external works, roads, paths, drainage, and gas or electric supply lines). This distinction perhaps seems obvious, yet it had not previously been used in comparisons of building costs in different areas.

The next problem was to analyse and explain variations in *net cost* per place in different areas or projects. Costs of labour and materials varied from region to region, but so did the design of schools; hence it was difficult to find a simple way to compare the cost of two different schools and judge which authority had made the most efficient use of scarce labour and materials. Clearly there was need for a new methodology for comparing costs of different schools, irrespective of their differences in size, design or location.

IV. Development of 'elemental cost analysis'

A new technique of building-cost analysis was developed, around 1949–50, to serve this purpose. Before 1949, there had been no generally recognized method of examining the costs of a new school. Architects would design a school, and in collaboration with quantity surveyors—who are experts on building costs—would prepare a cost estimate in terms of cost per square or cubic foot.[1] This made it possible to compare the initial cost estimate of a school, and the actual cost on completion.

In addition, the quantity surveyor would prepare a 'bill of quantities'—a detailed list of work items giving the description and quantity of every item to be used in the construction—which helped contractors in preparing their tenders (contract bids). The practice in 1949 was to present the bill of quantities in terms of 'trades', or particular building crafts, such as 'carpentry', 'painting', 'plumbing'.

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[1] 1 foot = 0.305 m.; 1 square foot = 0.092 m^2; 1 cubic foot = 0.028 m^3.

and in terms of quantities of work, such as yards of brick work. This list provided a sound basis for estimating the cost of a building, since it was detailed and specific and could be used in conjunction with data on current market prices in preparing a tender. It also provided a method of cost-accounting, since the bill of quantities could be used to check that each expenditure had been devoted to the purposes for which it was intended. But data on cost per square foot, together with a detailed list of construction items provided no basis for comparing the costs of two buildings, and explaining why they differed. The fact that one school might need more bricks than another or require more plumbers' time might simply have reflected differences in design or building methods rather than differences in basic efficiency. There was no way of knowing.

'Elemental cost analysis' was developed as a method of solving this problem. The purpose of elemental cost analysis was to present the cost data of different buildings in a comparable form and in sufficient detail to reveal significant differences in the distribution of the components of costs. The cost per square foot was insufficiently detailed, and the bill of quantities too detailed, to reveal such differences. Elemental cost analysis consisted in subdividing the building into a series of 'elements', common to all buildings, and showing the proportion of total cost per square foot attributable to each element. The choice of items, or 'elements', to be included in a cost analysis depended on a number of factors, for example: (a) each item had to be significant in itself, in terms of the process of architectural design of a building; (b) each item had to be capable of identification and isolation, regardless of the type of building method used; (c) cost data had to be readily available for each item.

It was clear that no unique set of 'elements' could be defined, but the most satisfactory method of distinguishing between different element was in terms of *functions*, common to all buildings yet independent of the type of building materials, methods, or design adopted in a particular building. Oddie defined an element in the following way: 'The essential characteristic of a cost element, therefore, is that it represents a part of a building which always performs more or less the same function, irrespective of its construction'.[1] One such breakdown of buildings into 'elements' might be:

Function	*Elements*
Enclosure	Work below lowest floor finish
	External walls
	Windows
	External doors
	Roof
Space Division	Internal structural walls
	Partitions
	Upper floors
	Internal doors

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[1] G. Oddie, *School building resources and their effective use; some available techniques and their policy implications*, Paris, OECD, 1966, p. 61.

Communication	Staircases
	Lifts
Independent Support	Frame
Fittings	Sanitary fittings
	Built-in cupboards
	Laboratory benches
	Desks
Specific Services	Heating
	Artificial lighting
	Water supply
	Ventilation
	Internal drainage
Finishings	Walls
	Floors
	Ceilings
	Decorations.

The use of such a list of 'elements' for analysing school building costs enabled the architect to see at a glance the relative importance of each component and to compare the distribution of costs in different buildings. It was thus far more useful than cost data presented in terms of quantities of concrete or bricks, and in terms of the labour of plasterers and plumbers.

Since 1949–50 the costs of school buildings in the United Kingdom have been analysed in terms of about thirty such 'elements'. This has provided a means of *interpreting* cost data so as, firstly, to describe the costs, standards and conditions of a particular building and secondly, to compare the costs of different buildings and to explain any cost variations.[1]

A *Building Bulletin* published by the Ministry of education in 1951 defined the purposes of this new type of cost analysis as follows:

1. To reveal the distribution of costs between the constituent elements of the building.
2. To relate the cost of any constituent element to its importance as a necessary part of the whole building.
3. To compare the costs of the same element in different buildings.
4. To discover how costs could have been allocated to obtain a better building.
5. To obtain and use cost data in planning other schools.
6. To ensure a proper balance . . . between superficial area per place and the cost per square foot.[2]

Table 1 shows a typical cost analysis in summary form for three primary schools. The analysis is carried out only for the net cost of the buildings. The variation in net cost per square foot from 62s.8d to 66s.11d. is not at first sight very large, but in fact it could amount to a considerable difference in the final cost of the three schools. The cost analyses of British schools are actually carried out in terms of pennies per square foot, in the belief that 'if rising costs are to be mastered . . . (it is necessary to know) not only how many pounds, or even shillings, were spent on a particular project, but how many pennies or even fractions of a penny were spent, and whether they ought to have been spent'.[1]

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[1] J. Nisbet *et al*, *Estimating and cost control*, London, Batsford, 1961, p. 39.

[2] Ministry of Education, *Building Bulletin No. 4: Cost study*, 2nd edition, London, HMSO, p. 3.

TABLE 1. Summary cost analysis of three primary schools

Element	A	B	C
		pennies	
1. Preliminaries and Insurance	39	37	24
2. Contingencies	18	12	10
3. Work below Ground Floor Level	79	54	39
4. Frame	nil	84	126
5. External Walls	66	39	54
6. Windows	67	60	63
7. Doors (External)			
8. Roof Construction	111	72	39
9. Rooflights	6	9	3
10. Upper Floor Construction	24	nil	28
11. Staircase			
12. Glazing	7	10	8
13. Internal Partitions	25	21	15
14. Doors (Internal)	24	9	18
15. W.C. Doors and Partitions	3	2	6
16. Wall Finishes	12	24	16
17. Floor Finishes	39	57	25
18. Ceiling Finishes	21	15	18
19. Decorations	15	30	24
20. Cloakroom fittings	9	2	6
21. Fittings	6	24	15
22. Furniture (Built in)	nil	nil	nil
23. Plumbing (External)	6	2	8
24. Plumbing (Internal)	22	15	14
25. Plumbing (Sanitary Fittings)	12	16	10
26. Gas Installation	3	4	6
27. Electric Installation	60	28	20
28. Heating Installation	77	66	90
29. Kitchen Ventilation	6	2	3
30. Drainage (Net Cost)	22	25	28
31. Playgrounds and Paved Areas	24	54	36
Net cost per sq.ft. of floor area[1]	803	773	752
	66/11	64/5	62/8

1. Lower total given in shillings and pence.

SOURCE J. Nisbet *et al.*, *Estimating and cost control*, op. cit., p. 93. Table 8; Oddie. *School building resources and their effective use...*, op. cit., p. 62, Table 13.

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[1] *Building Bulletin No 4*, op. cit.

If such cost comparisons were to be meaningful, they would have had to include measures of quality as well as quantity. The summary cost analysis shown in Table 1, therefore, may be supplemented by additional information: firstly by a detailed specification of each element and, secondly, some simple ratios which could provide a first measure of quality. Table 2 illustrates how a cost analysis reclassifies 10 individual items presented in the detailed bill of quantities into two elements. The quantities and relations between the 10 individual items would vary according to the design method of construction of different schools but the two elements are common to all school buildings, and therefore can be used for comparative purposes.

TABLE 2. Typical composition of two 'elements' used for cost analysis

Function	Elements	Information as classified in 'Bill of quantities'
Partitioning or space division	A. Internal partitions. (i.e. any wall partition or screen used to divide up the floor area into smaller spaces.)	1. Partitions 2. Glazed screens 3. Folding and sliding doors used for the division of rooms 4. Lintels over openings in partitions 5. Borrowed lights
	B. Doors (internal) (i.e. including frames and ironmongery but excluding glass.)	6. Doors 7. Door frames 8. Architraves 9. Cramps and dowels 10. Ironmongery

SOURCE G. Oddie, *School building resources and their effectives use...*, op. cit., p. 70.

It should be noted that the methodology of building cost analysis has been further refined and extended since 1950 to make it more useful for architects and quantity surveyors, and there now exists fairly detailed literature on the technical problems of elemental cost analysis.[1]

Moreover, elemental cost analysis, first developed for use in the educational field, has since been applied to many other types of building costs, particularly in the public sector. In 1956 the Royal Institute of British Architects devoted its annual conference to the subject of 'Architectural economies', and much of the discussion centred around cost analysis and cost planning.

[1] See *Building Bulletin No. 4: Cost study*, op. cit.; J. Nisbet *et al. Estimating and cost control*, op. cit.; G. Oddie, *School building resources and their effective use*, op. cit. Chapter VII, 'Building cost analysis', pp. 59–74.

V. The introduction of 'cost limits'

The analysis of school building costs was initially an attempt to find out information about the behaviour of building costs. It revealed wide variations between projects, due partly to price variations caused by local shortages of labour or materials, or by design details, but due also to the fact that there was a wide variation in the ratio of teaching area to total area in different schools. By 1949 it was obvious that either the number of schools built annually had to be reduced or these cost variations had to be reduced, if school building was not to make unreasonable demands on the country's resources. The Ministry of education therefore had good reason to attack the cost problem harder, and in 1949 announced that for the first time cost limits would be imposed, applicable to the following year's building programme.

The cost limits were set after detailed analysis of the cost per place of a large number of recently built schools. This analysis showed that in 1949 the average cost per place in primary schools was £195, and £324 in secondary schools, but that there were considerable variations around these means. It was decided, therefore, to set the new cost limits for 1950 below the average cost of buildings in 1949, but well above the minimum cost, in order to give architects reasonable design flexibility within the limits, as it was recognized that to set the limits in terms of the most economical practice in 1949 would simply be unrealistic, and would jeopardize the acceptance of the system of cost limits. Thus, the initial choice of costs limits was not entirely arbitrary, but it depended on judgement rather than on the application of a previously tried formula. The first cost limits, for 1950, were set at roughly 12.5 per cent below the 1949 averages: £170 per place in primary schools, and £290 in secondary schools. 12.5 per cent was chosen as a transitional step, as it had been decided to reduce the average cost per place by a total of 25 per cent over two years. Local authorities were asked to achieve half this saving in 1950, and the remaining 12.5 per cent in 1951.

When introducing the first cost limit the Ministry announced that no new project for 1950–51 building programme would be approved unless it fell within these limits. Local authorities were still required, however, to meet the minimum standards laid down in the building regulations, as provided in the 1944 Education Act. Thus, for the first time, architects were informed in advance of both the minimum standard and the maximum cost of new buildings. Within these limits the local authorities were free to experiment with individual designs, and the limits did in fact still provide considerable scope for such freedom.

The key to this flexibility was the decision that minimum standards should be set in terms of the *objectives* to be achieved, rather than the *means* of achieving them. This distinction is crucial. To illustrate it: a minimum standard of lighting in a classroom could be set in terms of area-of-window dimensions, *or* it could be set in terms of quantity of light itself. From the beginning it was agreed that the latter approach—of functional specifications—was better; not only did it focus attention on the desired ends, rather than means, but it left scope for individual

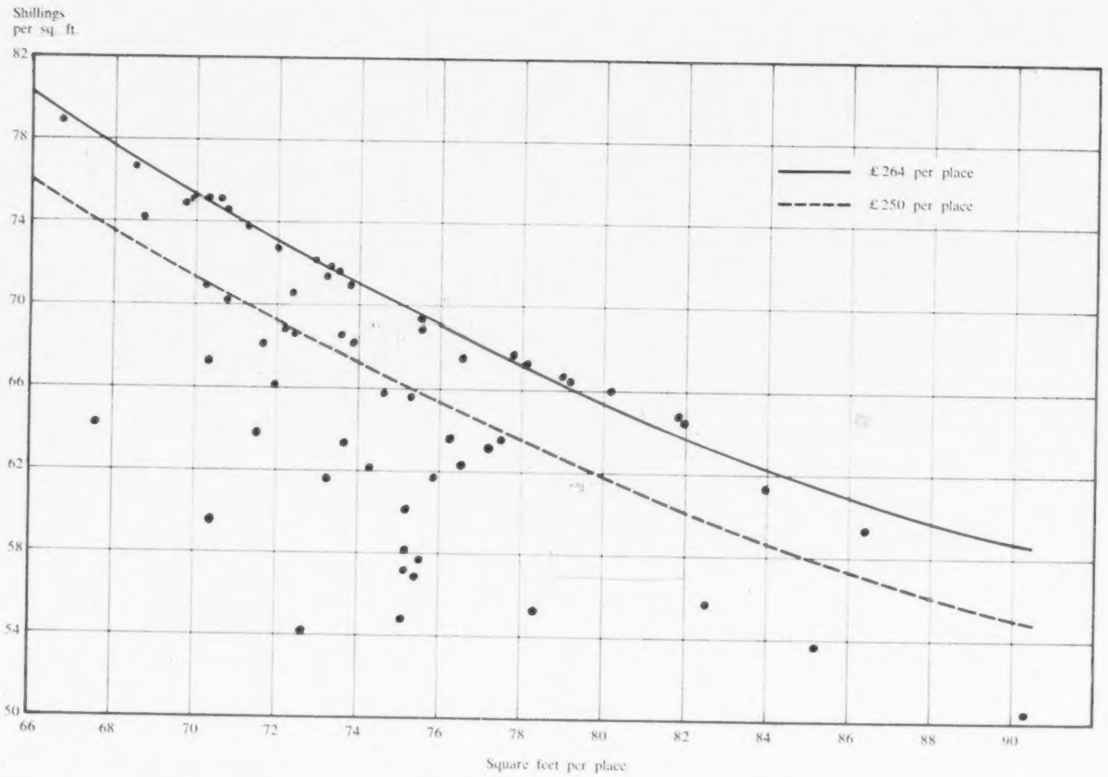

FIGURE 1. *Tender costs per square foot of sixty-four secondary schools (with kitchens) obtained between 1 May 1955 and 31 January 1956.*

architectural experiment. Similarly the maximum cost limits were set in terms of *cost per place*, rather than *cost per square foot*. To set the cost limits in terms of places left the architect free to select the best compromise between generous provision of space and expensive standards of building per unit of area. Figure 1 shows a number of alternative solutions to this problem of balance observed in 1956. All the designs fell within the cost limits then prevailing, but varied considerably in the actual balance chosen between cost and area.

The *cost per place* limits were actually expressed in terms of 'cost per equivalent place' rather than 'cost per pupil' to allow for variations in the cost per pupil according to the size of school and the age structure of the pupils. Small schools typically require a larger area per pupil than large schools, because certain minimum administrative, assembly and circulation areas are required irrespective of the number of pupils. Thus the cost per pupil tends to vary inversely with the size of the school. Table 3 demonstrates this point; it shows the cost per pupil in five British schools of different sizes built in 1965.

TABLE 3. Cost and area per pupil in five British schools, 1965

Number of pupils	Cost per sq. ft.	Area per pupil		Cost per pupil in £
		Teaching area	Gross area	
360	67.2 s.	30.4	43.3	143.3
160	68.3 s.	30.0	50.9	173.8
160	68.9 s.	40.0	53.4	183.0
50	69.9 s.	38.24	53.58	187.196
50	65.9 s.	33.79	57.06	187.886

SOURCE G. Oddie, *School building resources and their effective use...*, op. cit., p. 52.

The age structure of pupils also affects cost per pupil. Thus, for example, secondary school pupils need more space than primary school pupils, and older students, particularly over 16 years of age in the 'sixth form', require more expensive facilities, such as advanced laboratories. Therefore to have set a single uniform ceiling on 'cost per place' or 'cost per pupil' would have penalized small schools or those designed for a high proportion of older pupils. The Ministry introduced different standards of minimum teaching area per pupil for schools of different sizes and age structures. It also adopted the device of a 'cost place' for differentiating allowable costs according to size of schools and level of studies. Table 4 illustrates the way in which the minimum teaching area and the number of 'cost places' would be calculated for secondary schools of different sizes, according to the regulations of 1959.[1] It will be noted, for example, that a small school intended to accommodate 150 pupils was allowed 185 'cost places' (i.e. a cushion of 35), whereas a large school designed to accommodate 1,500 students was allowed

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[1] There have been a number of changes in school building regulations in the twenty-year period under review. Table 4 shows the standards currently in use.

TABLE 4. Minimum teaching area and cost places for commoner sizes of secondary schools

	(a) Schools providing a 5-year course for pupil ages 11-15 years inclusive assuming entry at 11 years plus		(b) Adjustments for sixth forms; additions to be made to (a) for numbers of sixth form pupils									
			30		60		90		120		150	
Number of pupils	Minimum teaching area sq. ft.	Cost places	Area sq. ft.	Cost places	Area sq. ft.	Cost places	Area sq. ft.	Cost places	Area sq. ft.	Cost places	Area sq. ft.	Cost places
150	7,080	185	+1,560	+40	+3,120	+80						
300	13,860	355	+1,530	+40	+3,060	+80	+4,590	+115				
450	20,790	520	+1,530	+40	+3,060	+75	+4,590	+115	+6,120	+155		
600	27,120	680	+1,500	+35	+3,000	+75	+4,500	+110	+6,000	+150	+7,500	+185
750	33,525	840	+1,485	+35	+2,970	+70	+4,455	+110	+5,940	+145	+7,425	+185
900	39,330	985	+1,455	+35	+2,910	+70	+4,365	+105	+5,820	+145	+7,275	+180
1,050	44,310	1,110	+1,410	+35	+2,820	+70	+4,230	+105	+5,640	+140	+7,050	+175
1,200	50,040	1,250	+1,395	+35	+2,790	+70	+4,185	+105	+5,580	+140	+6,975	+175
1,350	55,620	1,390	+1,380	+35	+2,760	+70	+4,140	+105	+5,520	+140	+6,900	+175
1,500	60,750	1,520	+1,359	+35	+2,718	+65	+4,077	+100	+5,436	+135	+6,795	+170

SOURCE United Kingdom, Department of education and science, *The building code*, 1963, p. 105.

1,520 'cost places' (a cushion of only 20 'cost places' for 10 times as many students). Mathematically this simply means a higher allowable cost per student for the small school than for the large one.

The inevitable difficulties of imposing stringent cost limits for the first time (in 1950) were minimized by lengthy prior consultations between the Ministry and local authorities. The situation was also helped by the willingness of local authorities to co-operate in view of the country's serious post-war economic problems, and by the further fact that the central government was in the strong position of providing a large proportion of the finance of local authorities. (In 1945 about half the current expenditure of local authorities was financed by central government grants.[1] Moreover, local authorities were often subject to local pressures to reduce expenditure, and therefore willing to accept the cost limits.)

VI. The need for a system of 'cost-control'

If the Ministry had simply introduced cost limits and nothing more, they might soon have become but pious expressions of intent. To be sure, the cost limits determined whether a project would gain Ministry approval at the design and tender stage, but if actual costs then proved to be higher than tender costs, the cost limits would in effect have been evaded. Fortunately the development of cost analysis had suggested that a form of cost *planning* and *control* might be used to ensure that actual expenditure did not exceed the tender estimates. The techniques of cost planning and control were developed by the originator of elemental cost analysis, J. Nisbet: 'The history of cost planning . . . is quite brief and spans barely a decade. It was conceived during an intensive period of cost analysis work at the Ministry of education in 1950, when the stabilization of school-building costs was made a priority task. It was noticed that the analyses showed a certain similarity in the distribution of costs among the various elements, and the idea was postulated that there might be an active as well as passive use for the figures. In other words, could not the costs of future school buildings be planned in advance, using, so far as possible, the information gained from the analysis of other schools having known specifications?'[2]

This development of an 'active role' for the information derived from cost analysis was very important. *At the design stage*, the building was divided into the thirty or so 'elements' used for cost analysis and *each element was allocated a*

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[1] See J. Vaizey, *The costs of education*, London, George Allen and Unwin, 1958, Chapter 3; H. Glennerster, A. Peacock and R. Lavers, *Educational finance: its sources and uses in the U.K.*, London, Oliver and Boyd, 1968, for a discussion of sources of educational finance.

[2] J. Nisbet *et al.*, *Estimating and cost control*, op. cit., p. 163.

a certain proportion of the total available money from the outset. Previously the customary procedure had been for an architect to design a school, and estimate the cost on the basis of his own experience, then to submit the design to a quantity surveyor for a detailed bill of quantities; tenders would then be invited on the basis of this bill of quantities and if the tender proved to be too high, the architect would probably be forced to modify the design to reduce the expected cost. A system of cost planning, on the other hand, required co-operation between architects and quantity surveyors from the very beginning of the design stage. This provided the architect with essential cost information at a time when it could actually influence the first stages of design, and thus eliminate the need for time-consuming modifications at a later stage.

Oddie has summarized the pre-requisites for a successful system of cost control under six headings[1]: (i) adequate *cost accounting* of expenditure on schools; (ii) a system of *building cost analysis* relating costs to standards; (iii) recognition of *cost determinants* coupled with local *cost indices*; (iv) pre-determination of *floor area and performance requirements*; (v) pre-determination of *expenditure limits for* providing (iv); (vi) appropriate *executive or design techniques.*

By 1950 in Britain these pre-requisites either existed or were being developed, and during the next 10 years cost control became a powerful weapon for reducing both variations in school building costs and the actual level of costs.

As noted earlier, cost control could only be effective if costs were tied to quality and if there were a clear, well-understood set of standards and criteria for judging quality. Thus the Architects and Buildings branch of the Ministry emphasized to local authorities in the assessment of projects the principle of 'value for money' rather than 'minimum cost'—that is, maximizing the output achieved with a given level of inputs, rather than simply minimizing inputs. Oddie explains this concept as follows: 'Economy in school building means, in effect, securing the *appropriate* standards for the lowest outlay, and the search for economy must therefore concentrate not on the reduction of standards but on the reduction and elimination of all that is underproductive or underused'.[2] In other words, the search for 'value for money' must not concentrate only on costs, but also on the *productivity* of school buildings.

VII. The attempt to increase productivity of school building

As productivity is a measure of the relationship between the costs of a process and its output, or results, the search for ways of increasing the productivity of school building proceeded on two fronts: an attack on costs, and a study of ways of improving output. The 'output' of a school building must clearly be measured in terms of space provided; but this is, in itself, not enough. The real purpose of a school building is not simply to provide roofs over heads, but to provide a suitable educational environment which conforms to current educational ideas and practices.

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[1] G. Oddie, *Prerequisites for cost control*, paper prepared for an OECD Seminar on Cost Control in School Building, Paris, April 1968. (Mimeographed and restricted).

[2] G. Oddie, *School building resources and their effective use...* op. cit., p. 17.

The development group of the Ministry of education began to analyse not only the costs of school buildings but the distribution of space. The results revealed that in many of the schools built between 1945 and 1949 more than half the space was used to provide 'non-teaching accommodation', such as corridors, staircases, administrative offices or entrance halls. Yet when teachers were questioned about their priorities it was clear that adequate teaching space was the first essential. Particularly in primary schools, the increasing emphasis on 'activity-based' methods of teaching demanded more space than formal methods of teaching, when children simply sat in neat rows of desks. At the same time the trend in primary schools towards providing a series of inter-related spaces containing a variety of equipment meant that there was less emphasis than previously on formal distinction between 'subjects' and on 'periods' in time-tabling. Generous provision of circulation space was therefore unnecessary, since children frequently spent long periods of time in one self-contained space. On the other hand flexibility became increasingly important, as teaching areas had to be used for a greater variety of activities.[1]

These considerations led to a reappraisal of the objectives of school building, and to increased emphasis on teaching space as the first priority. New schools were analysed in terms of the distribution of space between different functions, and 'plan analysis' developed as a corollary of cost analysis. Figure 2 illustrates the changes which occured in space distribution between classrooms, assembly and dining areas, administrative area and circulation space, in three typical schools built in 1949, 1952 and 1955. Figure 3 shows the average area per place in new schools between 1949 and 1959. Together these charts show that while the total area per place was reduced, the amount of *teaching* space was actually increased. In 1949 the typical proportion of area per place devoted to teaching accommodation was of the order of 40 per cent, leaving 60 per cent to non-teaching accommodation; by 1955 more than 67 per cent of the space was used as teaching accommodation as against less than 33 per cent for non-teaching purposes.

This trend resulted in a reduction in costs, not only because of the reduced area per place but because, at the same time, architects were developing methods of reducing costs per square foot. These mainly took the form of changes in building techniques, particularly the use of prefabricated components, and bulk purchasing of components to achieve economies of scale. As important as the cost reductions,

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[1] For an interesting account of some of the main changes in primary school organization and teaching in the United Kingdom at this time, see D. E. M. Gardner, *Experiment and tradition in primary schools*, London, Methuen ,1966; and United Kingdom, Department of Education and Science, *Children and their primary schools...*, op. cit.

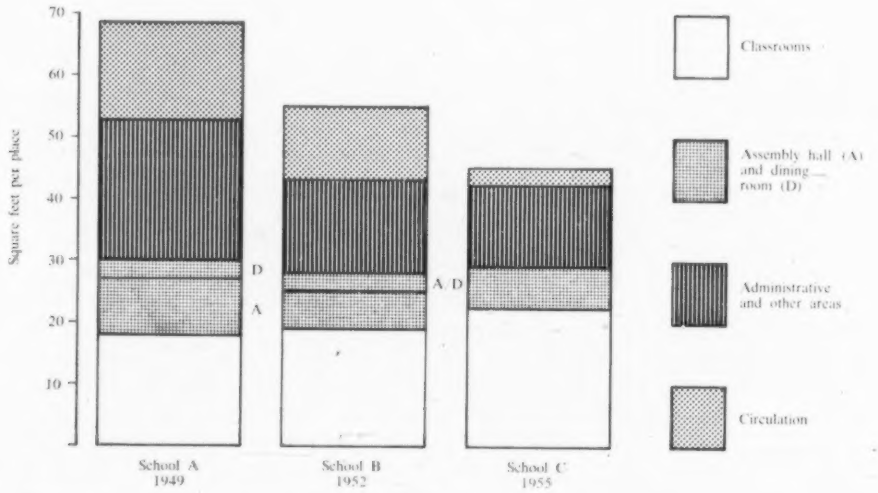

FIGURE 2. *Distribution of space in three typical schools.*

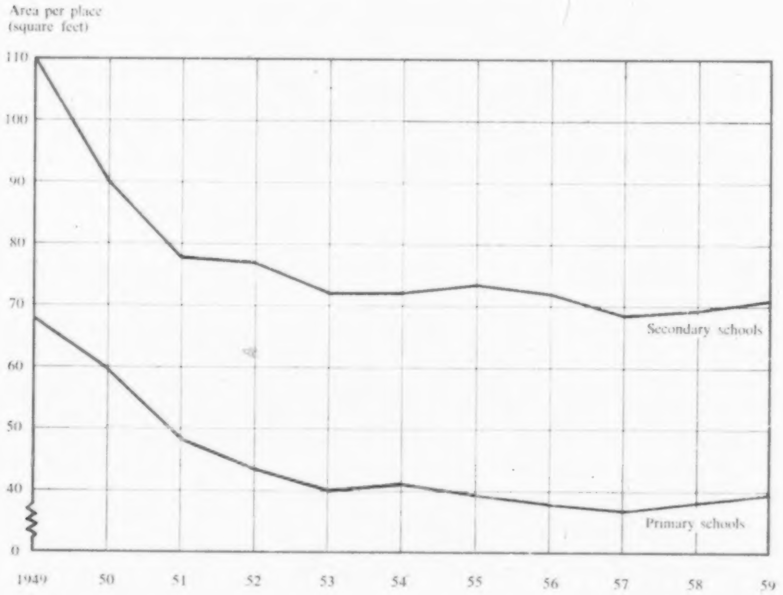

FIGURE 3. *Average area per place in primary and secondary schools, 1949-59.*

however, was the increase in the quality of buildings, judged in terms of provision of essential teaching space.

The new techniques of cost reduction owed much to experiments by Hertfordshire education authority aimed at finding an alternative to Ministry of works prefabricated huts. The Hertfordshire work led to the development of a system of prefabricated components based on standardized (modular) dimensions which were a distinct improvement over earlier ones. The development group of the Ministry of education continued this research, and in 1955 another local authority—Nottinghamshire—began intensive study of this method as an approach to solving its own particular problem, land subsidence due to mining. Nottinghamshire developed a new system of prefabricated construction for school buildings which overcame the problems of mining subsidence and reduced cost sharply; and at the same time a new method of bulk contracting was used which could produce significant cost savings. Previously the standard procedure had been to invite competitive tenders for each new project, but the construction of prefabricated components required large orders if there was to be maximum economy and efficiency. The authority therefore invited competitive tenders for one new school with the provision that the successful contractor would be awarded contracts for subsequent schools at the same rates. This method of 'serial main contracting' was able to reduce the level of costs considerably.[1] The cost per square foot of the first school built in Nottinghamshire using the new method of construction was 74s.3d., but after the introduction of serial main contracting the cost per square foot was reduced to 68s.

This experience demonstrated the importance of economies of scale in manufacturing school building components, and suggested that there might be further economies to be exploited if the school building programme were even larger. But this was clearly beyond the scope of a single authority. In 1957, therefore, the Ministry of education organized a meeting of neighbouring local authorities to explore the advantages of increased co-operation. The result was the formation of the 'Consortium of Local Authorities Special Programme,—generally known by its initials, CLASP—which consisted of seven authorities who agreed to combine their building programmes for the following year, use the Nottinghamshire methods of construction and contracting, and thus reap some of the benefits of bulk purchasing. In addition, they decided to regularly put aside a proportion of their capital funds for research and set up a development group.

The success of the CLASP experiment persuaded other local authorities to co-operate in combining their small building programmes to take advantage of large-scale production of components. The seven original members of CLASP were later joined by ten others and the movement spread to other areas. By 1968 there were in all eight consortia, covering most of the local authorities in England and Wales.[2] These consortia have demonstrated that by pooling their efforts, they could avoid duplication, share architectural and technical skills, and benefit from the economies of mass production of building components. There has never been any attempt, however, to achieve uniformity of school design; the philosophy of the consortia has been 'standardization of components', not 'standardization of schools'. In line with this philosophy, research has centred on the use of interchangeable components without reducing excessively the variety of design possibilities open to individual architects.[1]

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[1] See article on contracting methods by P. F. Bottle and J. Nisbet, 'Practice: negotiated contracts', in *Architects Journal*, London, 4 December 1958, p. 821–823.

[2] See G. H. Wigglesworth, 'Schools consortia and the future', *Journal of the Royal Institute of British Architects*, June 1966, pp. 265–272.

VIII. Further research into building costs

Throughout the 1950s the Ministry of education continued to study various aspects of the behaviour and determinants of costs, with a view to developing 'a systematic method of identifying and evaluating the items which account for differences in cost'.[2]

An example is a study of the influence of design on running costs and maintenance, or 'costs in use'. It was clearly recognized that a low initial capital expenditure for a building might be uneconomic if it subsequently entailed high maintenance costs, and that this was a factor which influenced architects in their choice of design. Yet on the whole no systematic method had been developed for evaluating alternative capital expenditures in the light of subsequent running costs. An American study of the maintenance costs of a number of schools over a five-year period established a correlation between initial capital costs and maintenance costs, but did not attempt to evaluate the different patterns of expenditure in terms of value for money.[3] This point, however, is crucial. For example one school, costing 8 dollars per square foot costs 8 cents per square foot to maintain each year, while another, costing 16 dollars per square foot, costs 4 cents a year to maintain. This demonstrates that to double the initial cost may result in a halving of the maintenance costs, but in view of the magnitudes involved, it is not a good way to secure value for money: an additional initial expenditure of 8 dollars in order to save 4 cents a year is very uneconomic.

The Architects and Buildings branch at the Ministry decided to investigate maintenance costs of school buildings of different ages and types by conducting a survey of actual maintenance and operating expenditures of 200 schools.[4] A

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1. See Department of education and science, *Building Bulletin No. 42: The co-ordination of components for educational building*, London, HMSO, 1968.
2. J. Nisbet *et al.*, *Estimating and cost control*, op. cit., p. 39.
3. See W. J. Zimmerman, *The relationship of initial cost and maintenance cost in elementary school buildings*, Stanford, School Planning Laboratory, University of Stanford, 1960.
4. See the chapter by D. MacDowell, 'Costs in use', in G. Oddie, *School building resources and their effective use*, op. cit., pp. 89–97.

method was then devised of comparing these costs, despite differences in the size, age and method of construction of schools. It involved drawing up a standard code of maintenance operations and, after analysis of actual expenditures in terms of this code, calculating maintenance per standard unit of 1,000 square feet. The annual expenditures were then expressed as a 'capitalized equivalent' based on certain assumptions about the life of school buildings and the real interest rate.[1] This concept of a 'capitalized equivalent' of annual running and maintenance costs made it possible to compare these future recurrent costs to initial capital outlay.[2]

The data obtained from the survey of maintenance costs revealed wide variations in running and maintenance costs and was used to investigate the implications for future current expenditure of alternative methods of building construction and alternative materials. The resulting method of calculating and comparing the present value of future maintenance charges has since been used to influence design decisions. For example in a recent extension to a secondary school in England, the development group of the Department of education and science, which was designing the project, was faced with the problem of choosing between two methods of heating, one with a higher initial cost but lower running and maintenance costs. The present values of both initial and running and maintenance costs were calculated for the heating, using either gas or oil. The initial cost of the heating plant was £2,912 in the case of gas, and £8,222 in the case of oil, but the estimated annual cost of running and maintenance was £581 for gas and £314 for oil. Both types of heating could be provided within the cost limits, so the problem was to find the most economic alternative over the whole life of the building. The present value calculations, based on 6 per cent rate of discount, showed that over a 60-year life the annual cost of the gas heating, including both amortized capital and running and maintenance costs, was £785, while for oil it was £864.[3] The advice of the architects, therefore, was to install gas-heating at a cost of £2,912 but to invest the capital-saving (£5,310 being the difference between £8,222 and £2,912) to finance the higher running and maintenance costs.

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[1] There is, of course, a problem in choosing the appropriate discount rate for this calculation; in practice the Ministry frequently assumed a life of 60 years and 4 per cent interest.

[2] A similar approach can be used to compare the two buildings quoted in the example above. The annual saving in maintenance costs of the $16 per square foot building can be expressed as a rate of return on the additional capital cost; thus, to obtain an annual income of 4 cents (the saving in maintenance costs) the additional capital expenditure of $8 would have to be invested at 1/2 per cent per annum. This low rate of return demonstrates again what a poor 'saving' this would be.

[3] See Department of education and science, *Building Bulletin No. 41: Sixth-form centre*, London, HMSO, 1967, p. 46.

IX. The results achieved

How successful were the measures described in previous sections in coping with Britain's post-war school crisis and in providing since then the maximum number of school places of a required standard within the existing financial and material resource limitations?

One test of success is the number of new school-places provided, compared to the need. As Table 5 shows, a total of more than 4.2 million new places were created between 1946 and 1966, at a total capital cost of just over £1,000 million. In the same period, the school population increased 2.1 million. Thus, about half the new school places took care of this increase; the other half involved replacement of old buildings, repair of war damage, and movements of the population.

TABLE 5. New school building in England and Wales, 1946–66

	Number of school-places built	Capital expenditure[1] (at current prices) £ million
Primary	2 094 200	...
Secondary	2 135 400	...
Total	4 229 600	1 071.1

1. Breakdown not available.

SOURCE Department of education and science, *Statistics of education*, 1966, Vol. 5, pp. 39-40, Tables 28 and 29, London, HMSO, 1967.

A second test of success is the spread between the actual cost of these new school-places and what they might cost had conventional pre-war practices been continued. The answer given below is necessarily approximate.

Between 1946 and 1949 all building costs rose steadily, including the costs of school buildings. But after 1949, when cost limits were introduced, the cost of school buildings (per place) fell until 1952, and thereafter rose by much less than building costs in general. Thus, by 1966 the general index of building costs had risen to 83 per cent above 1949, whereas the average cost of a school 'place' was only 5 per cent above 1949.[1] If the average cost of a school-place had risen at the same rate as general building costs, the total cost of four million new school-places would have been roughly £1,600 million, instead of just over £1,000 million.[2]

[1] Since 1953 the Ministry of public buildings and works has calculated a 'building cost index', based on raw material and labour costs. Before 1953, a similar index was calculated, using slightly different weights. We have combined these to provide a single index for 1949–66. The difference in weighting in the period 1949–53 may introduce a slight source of error, but it is unlikely to be very significant.

[2] This figure was calculated from the number of primary or secondary school places built each year, from 1946 to 1966, multiplied by the average cost per place in that year, inflated by the general building cost index.

This striking 'saving' is accounted for largely by (i) the reduction in the average area of a school place (though accompanied by an actual increase in *teaching* space per pupil); (ii) the development of more systematic ways of designing and building schools; and (iii) the economies achieved through large-scale purchasing and manufacture of components. Behind these immediate causes, however, were new techniques of cost analysis, cost planning and control, performance standards, research and development, new administrative arrangements, and effective co-operation among local educational authorities and between them and the central government.

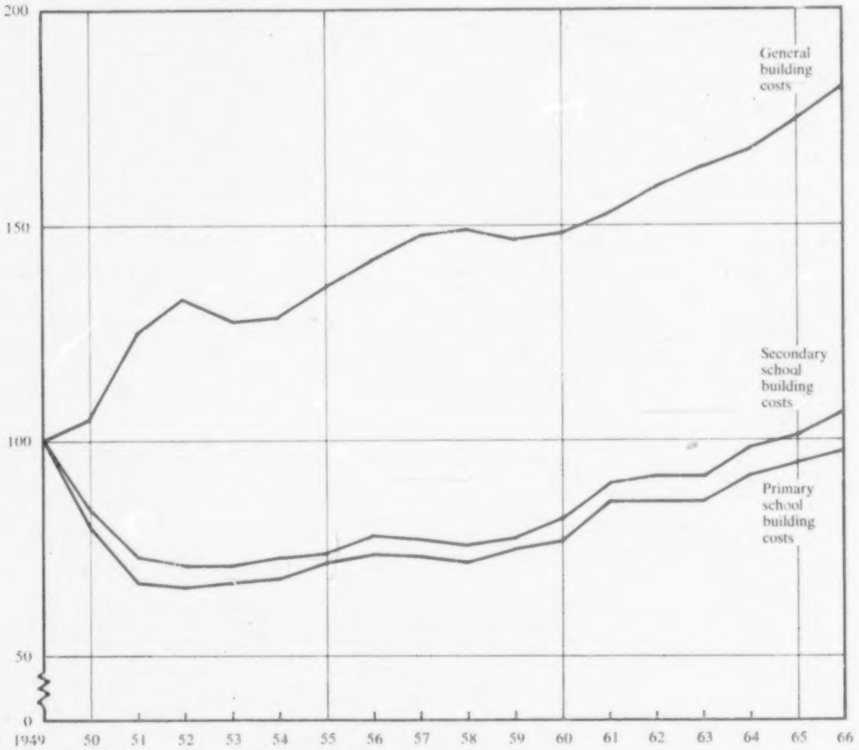

FIGURE 4. *Building cost indices 1949-66 (1949 = 100).*

The trends in building costs generally, and in the costs of primary and secondary school places between 1949 and 1966, are shown in Figure 4. The average actual cost per place of primary and secondary schools is shown in Figure 5, together with the official cost limits. The economies achieved by the CLASP system are even more dramatic.

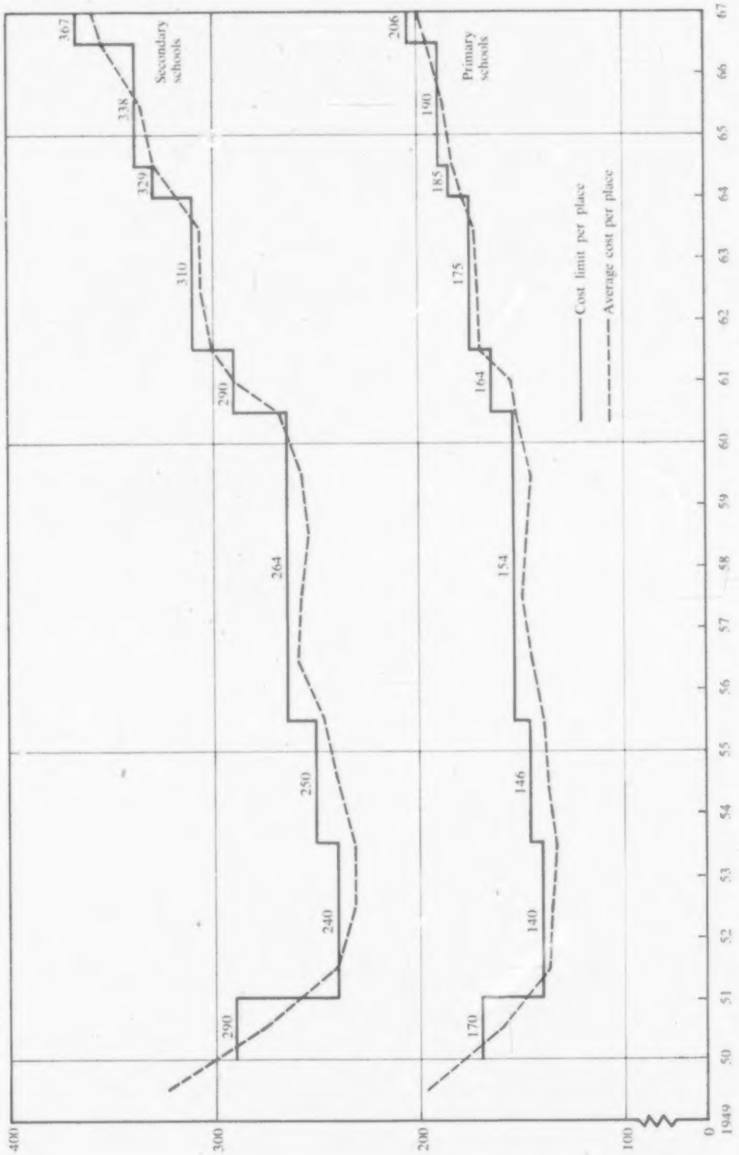

FIGURE 5. *Average cost per place of new primary and secondary schools and cost limits, 1949-67.*

X. Lessons for other countries

The experiences reviewed in this report grew out of historic and environmental circumstances unique to the United Kingdom. It would therefore be unrealistic to assume that the details of the new analytical techniques, administrative innovations and practices which proved so successful there could be transplanted as they are to other countries.

Still, the fact remains that the same basic problem which the British attacked is faced by virtually every other country in the world: how to get *enough* schools, and *good* enough schools, at a price which can be afforded. It would be surprising therefore if other countries, both rich and poor, could not learn some useful lessons from this British experience in the context of their own historic and environmental circumstances.

A. Examples of borrowing from British experience

Certain aspects of the British experience have become known in other countries in recent years, particularly among technical experts, and to some extent have been applied, in appropriately modified forms.

International organizations have played an important role in this transfer of experience. Unesco, for example, organized an international School Building Conference in London in 1962 which examined the problem of improving school-building efficiency in the light of British experience and made recommendations to the Member States of Unesco, such as the desirability of establishing 'development groups' for school buildings. Unesco's regional school construction centres in Latin America and Africa have also drawn usefully on the British experience in helping developing countries to get the best results from their limited school building resources.

The Organization for Economic Co-operation and Development (OECD) has likewise been an effective 'middleman' in transmitting useful lessons from this British school-building experience, in this case to continental European countries. Under the aegis of the 'Mediterranean Regional Project' OECD recently completed a special project known as 'Development and Economy in Educational Building' which 'took off' from the British experience and then proceeded—through development teams working in Greece, Portugal, Spain, Turkey and Yugoslavia—to explore new problems, to modify existing methods of analysis, and to develop new techniques best fitted to the special circumstances of these countries.[1]

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[1] A very useful report by Oddie describes this DEEB project and among other things demonstrates how the British experience and techniques can be usefully adapted by other countries: *Development and economy in educational building* ('DEEB' Report), OECD, Paris, 1968.

Drawing on the British experience, and also using their own ingenuity, a number of other countries in recent years have reduced school-building costs through the standardization and prefabrication of components—among them Ireland, the Netherlands and Sweden. A few other European countries in which local authorities, as in Britain, have prime responsibility for school construction—notably Germany and Italy—have adopted arrangements similar to the CLASP system to secure school-building economies through co-operation among local authorities.

The question naturally arises whether nations at an earlier stage of development than those so far mentioned can benefit from the British experience in view of the less developed condition of their construction industry, their sparser information about prices, costs and wages, and the limitations of their systems of public administration. Certainly these factors inhibit the application of highly sophisticated techniques, but there is good reason to believe that the same basic principles can be usefully applied if they are properly modified to fit the different circumstances. To cite an actual case, the International Development Association (IDA) of the World Bank financed an education project in Nigeria in 1967 and invited a team of building experts to formulate proposals for the Nigerian government on appropriate standards and procedures for educational building to which the IDA project should conform. The work of the team, drawing on British experience, covered such aspects as the determination of minimum standards for school buildings, maximum limits for capital cost per place, the concept of 'equivalent place' for calculation of cost limits per place, and the variations that should be taken into account when setting cost limits. Their research was also helped by the existence of an earlier report on building costs in Northern Nigeria.[1]

B. Guides to improving productivity of school building

Of the various features of the British school building experience described earlier in this report, the following ones may well be of greatest relevance and value to other countries.

1. *'Elemental cost analysis'*

Clearly the technique of elemental cost analysis, as the British developed and applied it, cannot be transferred in detail to other countries. The particular form of this technique in Britain grew out of traditional methods of tendering, and particularly the 'bill of quantities' customarily drawn up by the quantity surveyor—a profession which does not exist as such in many countries. And yet the need for a systematic way of comparing and explaining differences in school construction costs is important in every country, whether developed or developing. Thus the basic principles of elemental cost analysis should have useful application anywhere, so long as they are appropriately expressed in terms of local tradition and practice. Needless to say the particular 'elements' must be chosen in the light of local design and building practices. The one essential is that comparisons should be based on the same set of elements for the sake of consistency and comparability.

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[1] Robert Matthew, Johnson-Marshall and Partners, *Report on building costs to the government of Northern Nigeria*, 1963.

The DEEB teams felt the need in Mediterranean countries for a means by which they could compare costs, explain differences among schools, and explain even differences in the same school between the originally estimated cost of construction and the actual cost: 'When the teams began their work nearly all countries knew that there was wide variation in the cost of their schools. They tended to regard costs as virtually unpredictable and to accept wide variation as the inevitable consequence. Most school construction projects were subject to approval of pre-contract estimates, but these contracts seldom resembled, nor were expected to resemble, the final real expenditure incurred by the time the building has been completed . . . A way must be found of making forward estimates reliable and a system of cost control devised to ensure that estimated or planned expenditure produces, in the event, as much as it has been expected to'.[1]

The experience of the expert teams in DEEB countries showed that in many developing countries only the most rudimentary bill of quantities was available, so that detailed cost analysis was not yet feasible. Yet their experience also showed that some *ex-post* evaluation of capital expenditure was possible, and if combined with good yardsticks of building quantity and standards, could serve as both an explanation of cost behaviour and a basis for cost control.

Such an attempt to explain cost variations can emphasize the importance of such factors as size of school and age of students in determining cost per pupil. The British found the concept of a *cost per place* a very useful device for taking these important variables into account, by varying the number of allowable '*cost places*' for a given school project according to a standard formula. This same approach could be refined to take account of other factors (such as the proportion of pupils taking school meals or the proportion of boarding and day students) that help determine costs.

In some developing countries other factors, such as urban and rural location, may be more important than size or age of pupils, but the concept of 'equivalent places' can be utilized in such situations.

The appropriateness and feasibility of *cost limits* will depend, of course, on the method of financing capital expenditure and on where responsibility for school construction resides in a particular country. In Britain the local authorities had a long tradition of individual autonomy, and professionally competent staffs of architects. In other countries, where school building is centrally financed, planned and controlled, there is no need for cost limits on local authorities. But there is nevertheless a need for cost norms and limits to guide the central authorities and a need to ensure maximum incentive for architects to find the most economical methods of design. The DEEB project found that 'All teams have shown that the working conditions represented by the minima recommended can be obtained at costs proportionally well below those at present incurred'.[1]

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[1] DEEB Report, op. cit., p. 51.

2. *Analysis of school space*

A major source of economy and improved utility of school buildings in Britain resulted from the redeployment of space as between teaching areas and non-teaching areas. Certain other countries have also found space analysis and redeployment advantageous.

Some of the DEEB teams found far greater disparities between *total* areas of schools than between their teaching areas—the result of misplaced controls and incentives. They found that the setting of *maximum* standards for teaching areas had the paradoxical effect of encouraging wasteful provision of non-teaching areas. Thus in some cases they recommended the reverse approach of setting *minimum* standards. In Portugal it was discovered that by redistributing space in primary schools teaching areas could be increased by 25 per cent with no corresponding increase in total area (see Figure 6).

3. *Quality standards*

The British experience with respect to standards of school building is instructive in that the British decision to use *functional* standards rather than rigid specifications of design, materials, size and construction methods avoided 'freezing' old practices. It also provided both a challenge and latitude to architects and builders to search for new and better ways—and often more economical ways—of meeting clearly defined *performance* specifications.

There are, for example, a variety of ways of ensuring appropriate lighting or heating conditions in a school, or of handling problems of noise, circulation, sanitary services, audiovisual aids and the like. And there is almost always room for improvement—if standards are so defined as to protect quality while at the same time leaving scope for new ideas and techniques.

4. *Economies of standardization and mass production*

The British adoption of standardized components, bulk buying and mass production was another major source of economy without sacrifice of quality. It happened to grow out of the particular system of local educational authorities in that country, but the same principles of standardization and economy of scale apply in other kinds of administrative situations.

5. *The development of system building*

This method (a) saved time for the administrator, the architect and the builder;

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[1] DEEB Report, op. cit., p. 89.

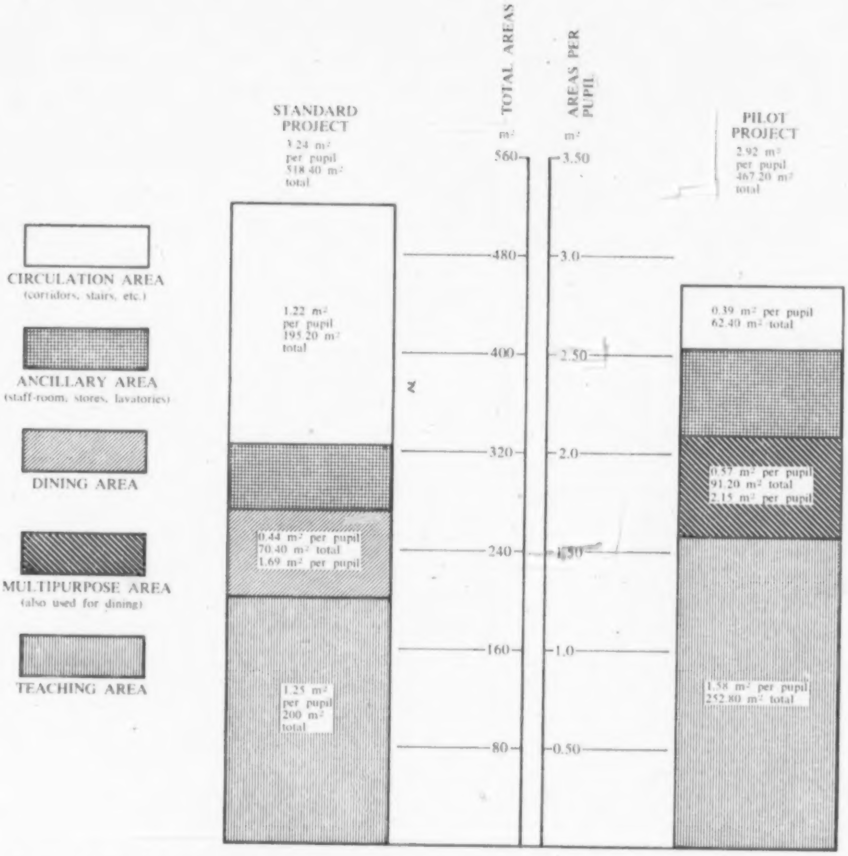

FIGURE 6. *The Portuguese pilot project: area comparison*

(b) used factory production rather than scarce building crafts; and (c) allowed better control of cost.

Equally important, the British experience demonstrates that standardization of major components in the interest of economy and quality need not mean a dreary standardization of design.

6. *Research and development*

The decision of the members of the CLASP consortium to invest a specific share of their annual construction funds regularly in research and development was an extremely important advance. Much lip-service is paid to research generally in educational circles, but rarely is this backed up with adequate resources. In this case the *demonstrated* value of previous research and development efforts—at both the local and national level—had left little doubt, even among the most hard-headed custodians of public funds, that funds properly invested in this direction could pay enormous dividends. Another important feature of the research and development of new building techniques was that it included actual projects carried out, so that its relevance could be immediately recognized. Even some of the most developed countries that deploy vast resources on research and development in other directions could learn from the experiences of Hertfordshire, Nottinghamshire and the Architects and Building branch in Britain.

7. *Index of building costs*

The analysis and control of school-building costs in Britain depended importantly on a comparison of actual trends in school building costs and general building costs, revealed by an *index of building costs*. In the absence of such a cost index it is impossible to compare trends in school building costs with other construction cost patterns, to discover to what extent rising school-building costs are the result simply of increases in the prices of materials and labour or to know what allowance to make for price increases when setting cost limits or estimating future capital expenditure. In Britain, the Ministry of public buildings and works regularly collects and publishes an index of building costs, and the Royal Institute of Chartered Surveyors calculates an index for use by its own professional members. Many other countries similarly construct special indices of building prices, by combining data on the price of raw materials such as timber, and wage rates in building trades. Oddie describes such a building cost index calculated in Spain, and shows how this is used when estimating the capital costs of a new school by means of a special 'fluctuation' clause, included in all contracts, and tied to the building cost index.[1]

C. Guides to improving educational productivity generally

Useful conclusions can be drawn from the British experience not only for improving school building but for ways to approach the broader goal of improving educational efficiency and productivity in other respects as well.

The first obvious conclusion is that in order to understand better the behaviour and determinants of educational costs, *it is necessary to search for new methods of measurement and analysis*. In 1946 it was virtually impossible in Britain to compare, in any meaningful way, the costs of different types of school building, and to relate differences in cost to variations in standards and quality. The development of elemental cost analysis provided the architects and school authorities with such a tool. This had two important results. Firstly, it improved the accuracy and reliability of initial cost estimates, and made it possible to plan realistically future capital expenditure levels and distribution. Secondly, the information gained from cost analysis was used in a positive way to reduce costs, both by the introduction of cost limits and by encouraging the invention of new building techniques.

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[1] G. Oddie, *School building resources and their effective use...* op. cit., pp. 80–83.

An equally important conclusion is that analysis of costs should be accompanied by an *analysis of standards*, and by a willingness to re-examine and redefine educational objectives to take account of changing conditions. Just as the British used functional school-building standards to emphasize the *ends* rather than the *means* and to give play to the individual architect's initiative and creativity, so also should performance standards throughout education stress ends rather than means and give wide latitude to the initiative and creativity of individual teachers and administrators.

A third important conclusion from the British experience concerns the need to *create new administrative structures* and procedures in order to put into effect some of the policy conclusions drawn from research and development. Notable examples in this case were the creation of the system of cost limits, which was a direct result of the analysis of cost variations between local authorities, the 'development groups' which spear-headed better techniques of design and construction, and the local authority consortia which achieved economies through large-scale manufacture and purchase of components. All these innovations, it is worth noting, were attacked at the time of introduction as unfeasible, given the strong British tradition of local autonomy. Any administrative innovation runs this risk, but the risks of *not* innovating—of trying to make do with old administrative patterns in new situations—are immeasurably greater and more hazardous.

Underlying the success of these new administrative arrangements in Britain were the *co-operation* and *team-work* that developed between central and local government in planning school building programmes, and between architects, cost specialists, engineers, manufacturers, and not least of all, educational specialists and administrators. The inclusion in development groups of teachers or school inspectors meant that the school designers attempted to follow closely the latest developments in educational theory and practice. This would seem to be an important strategy to follow not only in designing school buildings but in designing new 'systems' of teaching and learning, and of educational management.

A fourth conclusion relates to the search which the British made for ways of increasing the productivity of school building. It was a two-pronged attack. The first was *to identify the current 'best practices'* in the design and construction of school buildings and then to try to raise the general level of performance elsewhere to the level of these best practices. The initial application of cost limits, for example, aimed at reducing local variations in costs by providing incentives to all architects to emulate the efficiency of their most successful colleagues. The second approach was to try *to improve the 'best practice'* techniques themselves. An example here was the introduction of methods of collective purchasing to achieve the economies of large-scale production of standardized components. The whole success of the post-war British building programme was heavily dependent on widening the applications of advanced technologies and methods of analysis, while at the same time improving these techniques. Both approaches recommend themselves for broader application to all the affairs of education.

Finally, perhaps the major and most encouraging conclusion to be drawn from the British experience is that *rising costs need not be regarded as inevitable*. Up to 1949 the costs of school building, like other building costs, had risen steadily. After 1949 other building costs continued to rise, but the average costs of school buildings fell and thereafter remained remarkably stable. Without this determined and successful effort to fight off rising costs, the national school building bill might have been 60 per cent greater—or thousands of children would have gone without adequate schools.

If rising costs do not have to be taken for granted in *building* schools, perhaps they do not have to be taken for granted either in the *running* of schools.

The Ministry of education wrote in its own short survey of school building between 1946 and 1956: 'School architects have not sat passively allowing themselves to be carried along by rising costs but have sought aggressively how to defeat them without sacrificing essential standards. In the last analysis it is a question of where the initiative is to lie—with the architect or with the index of building costs'.[1]

The British experience may be said to provide *five guidelines for reducing costs and increasing the productivity throughout any education system:* (1) by greater knowledge and control of the constituent items of cost, and their determinants; (2) by careful examination of objectives to ensure emphasis on those of highest priority; (3) by the search for new, better, and more economical methods of solving old problems, using technical and pedagogical skills; (4) by increased emphasis on *ends* to be attained, rather than means; and (5) by reducing expenditure on non-essentials.

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[1] United Kingdom, Ministry of education, *The story of post-war school building*, op. cit., p. 56.

Canada

23

Comprehensive analytical methods for planning in university systems — planning a new health sciences education complex

prepared by Jack Levine, Richard Judy *and* Richard Wilson

This case study has been prepared at the request of IIEP by a team of researchers, Mr. Jack Levine, Professor Richard Judy and Mr. Richard Wilson, principals of Systems Research Group, Toronto. In order to relate this study to the IIEP research project on cost analysis, the Institute has prepared a general preface.

Introduction[1]

This study describes a relatively new approach to university planning and decision-making—using systems analysis and simulation models— which has lately become the subject of lively interest in the university world. It deals with the cost implications of alternative courses of action, not merely in monetary terms, but in terms of real resources.

During the past five years, the Systems Research Group (SRG) in Canada has gained useful experience in the development of cost simulation models and their application to planning the allocation and utilization of resources in higher education. The SRG group, headed by Professor Judy and Mr. J. B. Levine, worked as a team of technical consultants to the University of Toronto, where they applied a series of computer simulation models to the Faculty of Arts and Sciences and the Faculty of Medicine. These models were presented in several reports (see bibliography) under the acronym CAMPUS (Comprehensive Analytical Methods for Planning in University Systems). CAMPUS [illegible] a systematic way the functioning of the university and 'provides a structure which is capable of assessing the resource implications of various sets of programmes and activities just as an engineering model can be used as a basis for prediction and design'. In other words, CAMPUS is a tool for estimating the cost implications of alternative decisions affecting the utilization of staff, space and other resources in institutions of higher education.

In the case of the University of Toronto, the CAMPUS methodology was used for example:

1. To help prepare for an expansion of the entering class of medical students from 175 to 250;
2. To examine the resource implications of a planned basic re-design of the undergraduate medical curriculum;
3. To determine the resource consequences of a major expansion of medical research recommended by a Special Committee of the Board of Governors;
4. To determine the cost implications of an expansion of graduate studies, coupled with a transfer of training responsibility from affiliated hospitals to the university's own faculty of medicine;
5. To redefine the respective roles of eleven affiliated teaching hospitals with a view to avoiding duplication of expensive clinical and research facilities;
6. To analyze staffing and remuneration policies and, more specifically, the feasibility of converting the present teacher-practitioner staff to a full-time teacher-research staff.

It is interesting to note that the foregoing applications of CAMPUS were not simply theoretical exercises, but produced results that were actually used by deans and other institutional administrators in reaching decisions regarding alternative policies, plans and programmes within each department or division. According to the members of SRG, the cost savings brought about by means of this analysis have been significant and represent more than 100 times the investment.

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[1] Prepared by the staff of the IIEP.

It was thus considered worth while to ask the SRG to prepare the following report on CAMPUS as one of the case studies in the IIEP research project on cost analysis. It differs from other case studies in this series in that it does not examine the methodology of CAMPUS in detail or its application in one specific case (matters which are well covered in other documents shown in the bibliography). Instead, this report provides a non-technical description of the development and use of simulation models of the CAMPUS type, designed to give the reader a clearer idea of what these newer analytical techniques are about. Moreover, instead of monetary costs, it deals mainly in terms of real resources (teachers, facilities, hospital beds, etc.). These, of course, can be translated into monetary terms, but it seemed valuable, in this instance, to emphasize the general applicability of such models to the evaluation of real resource costs.

This report traces the historical development of CAMPUS, defines the categories of models used and the types of planning and decision-making problems to which they are applicable, gives a few numerical illustrations, and, lastly, discusses the feasibility (including the approximate cost) of applying this approach in other countries and to other levels of education.

I. The challenge to educational administrators

University planning and budgeting have traditionally been carried out in an informal and unsystematic fashion by rule of thumb and personal persuasion. Under today's conditions of burgeoning enrolments and limited resources such an approach is no longer appropriate. More formal methodology is needed to enable the university to use its resources as efficiently as possible.

Public expenditure is increasing rapidly in all fields, and the list of competing claimants is a long one. Even within the field of education, the competition for resources is keen; elementary and secondary education claim a larger share of resources, while universities multiply new and expensive programmes of instruction and research, thus giving rise to much talk of a 'crisis' in university finance.

It is thus obvious that universities need to manage their resources with skill and professionalism. It is no reflexion on university administrators to say that the ingenuity and expertise which they have lavished on the problems of society have not been applied in equal measure to the problems of the universities themselves; the tools of management science, economics and operations research have been applied almost everywhere except to universities. Our basic proposition is that more sophisticated and powerful tools are needed to solve the problems of efficient resource allocation within the universities. They are even more necessary to demonstrate to the public at large that university needs are real and justified. This is not always an easy task; as McGeorge Bundy, President of the Ford Foundation, has noted, while university administrators are saying that they face imminent bankruptcy, in the eyes of the American people the universities are an opulent and triumphant success. Bundy puts it as follows:

> 'But what is much more serious is that with the tools now available they cannot really prove their case. They simply do not have the facts and figures they need. Let me emphasize that I do not say that the facts and figures do not exist—I say only that they do not have them. They do not have them for the simple and fundamental reason that as a class neither colleges nor universities, public or private, large or small, old or young, have ever made it their business to learn and to tell the whole story of their resources and their obligations, their incomes and their expenses, their assets and their debts in such a way that the public can fully and fairly judge their economic position.'[1]

That is what CAMPUS and the Systems Research Group are all about—to help universities and colleges to gain the maximum educational advantage from the resources at their disposal, and to demonstrate to the public and to other sources of funds that their needs are real and justified.

II. CAMPUS research, development and implementation

Systems analysis for efficient resource allocation in higher education has been under way in Toronto for four years. During this period, efforts at research, development and implementation have been undertaken. The following sections summarize the main elements of this work, leading to the case study which will be dealt with in more detail.

A. The CAMPUS I pilot study

In the autumn of 1964 Dean Vincent Bladen, Chairman of the Commission on Financing Higher Education in Canada, asked Professor R. W. Judy to build an econometric model to analyse cost data which had been collected by the Canadian Association of University Business Officers. Professor Judy concluded that these data would not support the kind of investigation desired by the Commission, and he and J. B. Levine submitted a counter-proposal to develop a cost simulation model. The Commission accepted this proposal and authorized them to proceed with the pilot study.

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[1] McGeorge Bundy, 'Advice to educators: be candid about your money problems', *Think*, Jan.-Feb. 1968, p. 32.

The pilot simulation model was developed during the first six months of 1965. The institution simulated was the Faculty of Arts and Sciences at the University of Toronto. Under the acronym CAMPUS (Comprehensive Analytical Methods for Planning in University Systems), this model was reported on in 'A New Tool for Educational Administrators'.[1]

B. Implementation of CAMPUS at the University of Toronto

Two major implementations of CAMPUS methodology have been undertaken at the University of Toronto.

1. *The CAMPUS II implementation*

Late in 1965 President Claude Bissell and Vice-President Frank Stone asked Judy and Levine to develop plans for the implementation of CAMPUS at the University of Toronto. Development work lasting two years began in January 1966, and a new staff group, the Office of Institutional Research (OIR), was formed. The Director of the Office, B. L. Hansen, was appointed special assistant to the President in the expectation that he would gain sufficient knowledge of important policy questions to bring the resources of his staff to bear on them. The Systems Research Group (SRG), an organization directed by Professor R. W. Judy and Jack B. Levine, functioned as technical consultants to OIR during the first two years of the project's life and developed the initial models.

2. *The components of CAMPUS*

CAMPUS began in 1965 as a computer simulation model of a university. In order to supply the model with much of the data required, it became necessary to add an information system describing various aspects of the institution. Organizational considerations about the means by which the model could be integrated into the budgetary process of the university led to the incorporation of a planning, programming and budgeting system into CAMPUS. Most recently, a fourth component has been added, a master planning system which uses the model as the basic ingredient of the Institution's long range physical plans (see Figure 1).

CAMPUS was designed to meet two main objectives:

1. To develop a structure which is a precise and unambiguous description of the university system, similar to that which is provided by an engineering model describing a physical system.

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[1] See the bibliography at the end of this study.

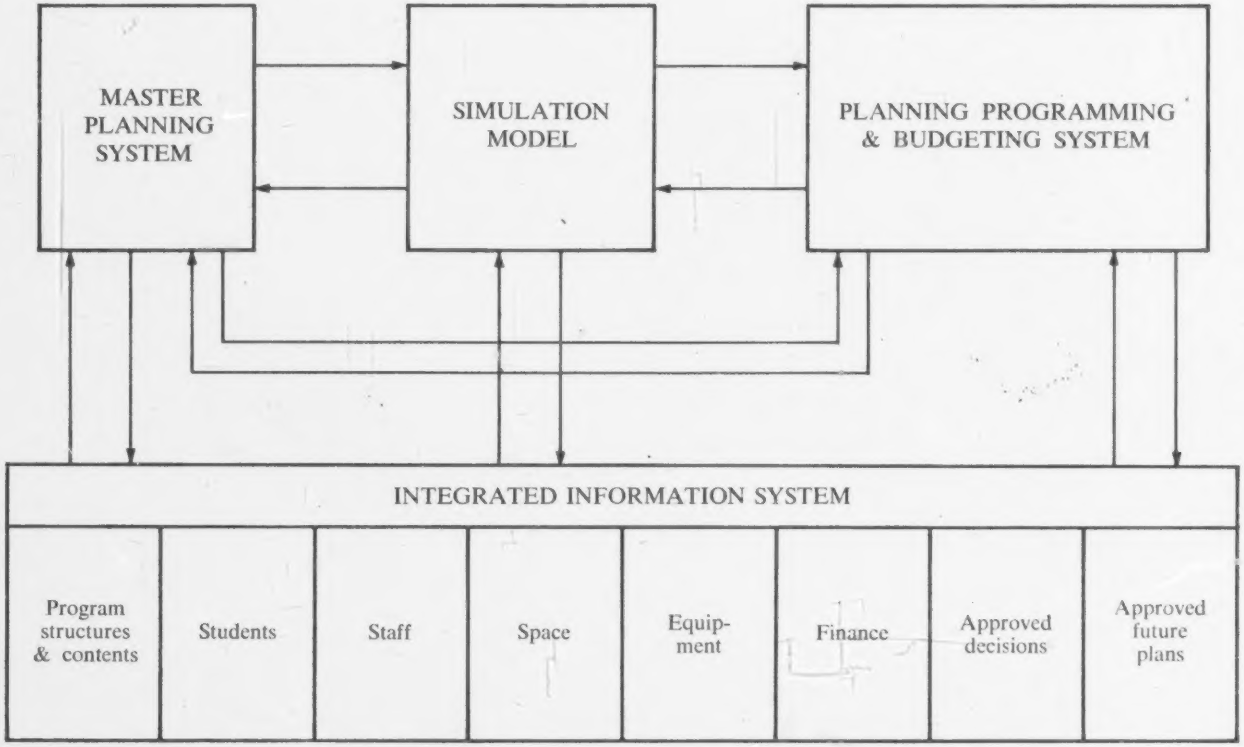

MASTER PLANNING SYSTEM
SIMULATION MODEL
PLANNING PROGRAMMING & BUDGETING SYSTEM
INTEGRATED INFORMATION SYSTEM
Program structures & contents
Students
Staff
Space
Equip-ment
Finance
Approved decisions
Approved future plans

FIGURE 1. *CAMPUS: Comprehensive Analytical Methods of Planning in University Systems.*

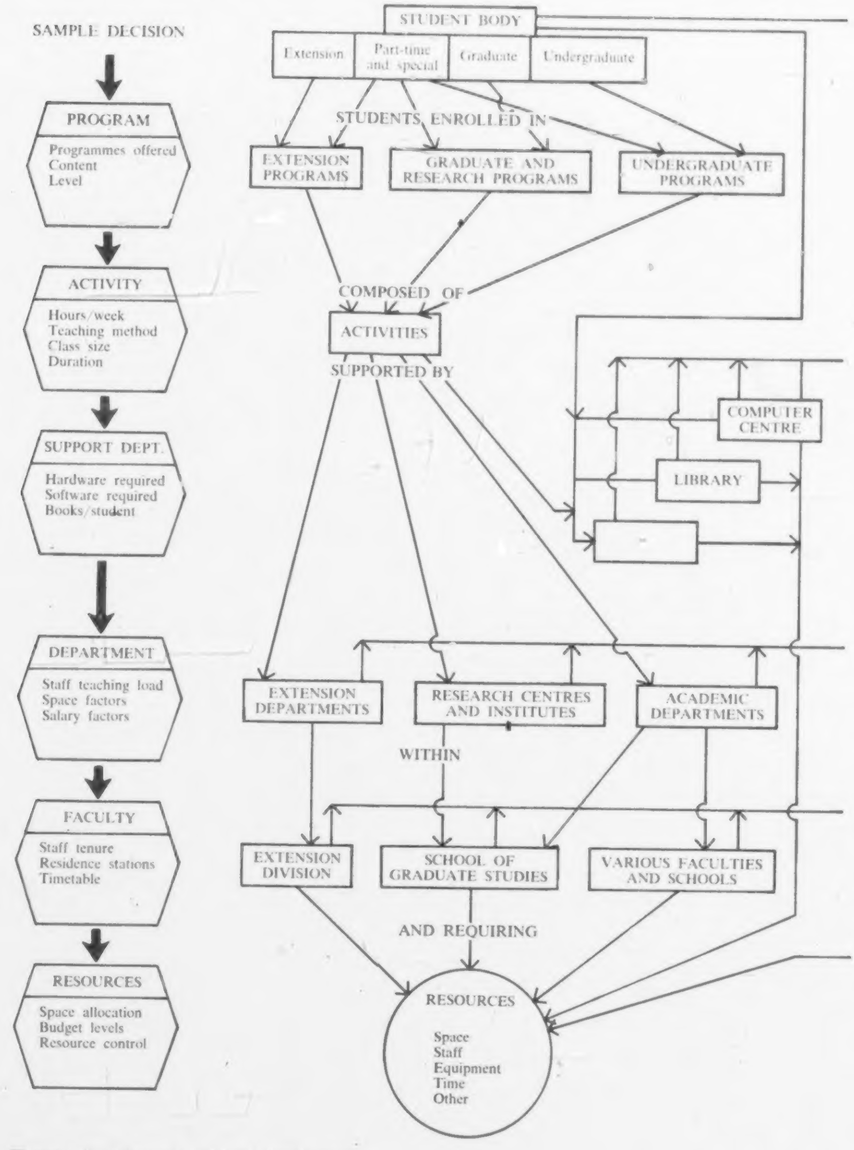
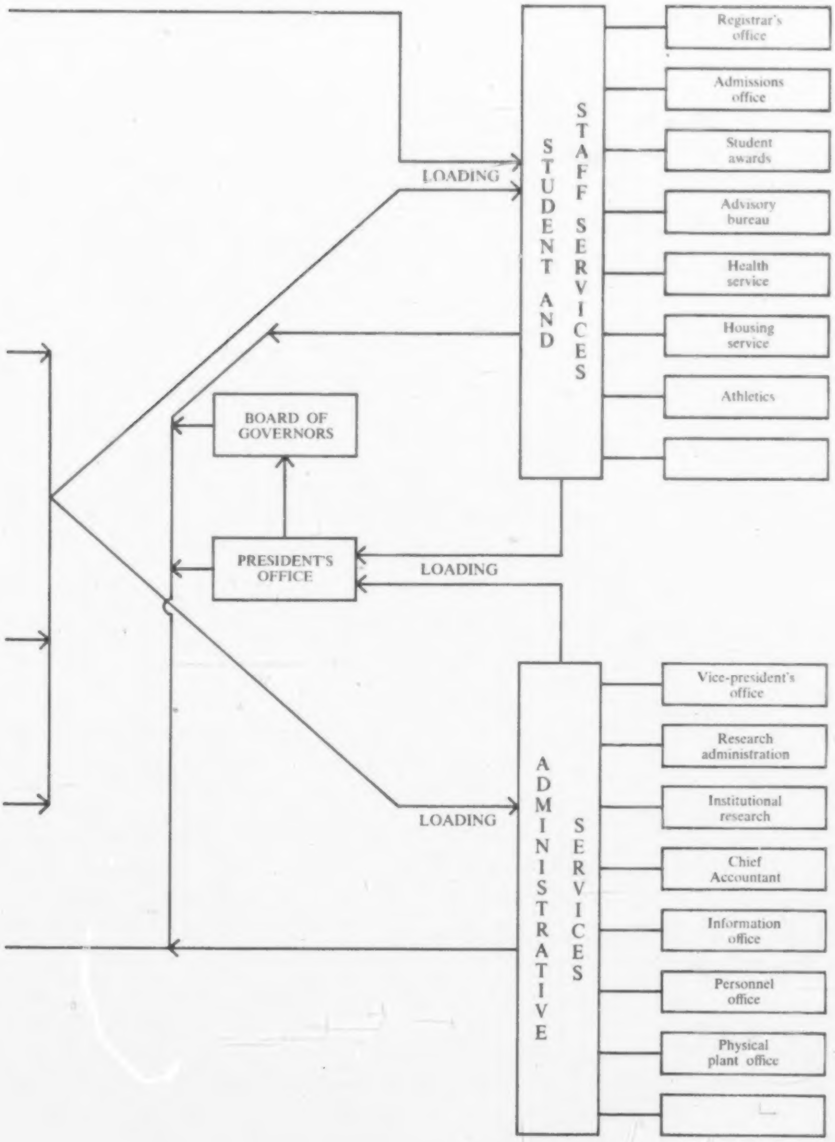

SAMPLE DECISION
PROGRAM
Programmes offered
Content
Level
ACTIVITY
Hours/week
Teaching method
Class size
Duration
SUPPORT DEPT.
Hardware required
Software required
Books/student
DEPARTMENT
Staff teaching load
Space factors
Salary factors
FACULTY
Staff tenure
Residence stations
Timetable
RESOURCES
Space allocation
Budget levels
Resource control
STUDENT BODY
Extension
Part-time and special
Graduate
Undergraduate
STUDENTS ENROLLED IN
EXTENSION PROGRAMS
GRADUATE AND RESEARCH PROGRAMS
UNDERGRADUATE PROGRAMS
COMPOSED OF
ACTIVITIES
SUPPORTED BY
COMPUTER CENTRE
LIBRARY
EXTENSION DEPARTMENTS
RESEARCH CENTRES AND INSTITUTES
ACADEMIC DEPARTMENTS
WITHIN
EXTENSION DIVISION
SCHOOL OF GRADUATE STUDIES
VARIOUS FACULTIES AND SCHOOLS
AND REQUIRING
RESOURCES
Space
Staff
Equipment
Time
Other

FIGURE 2. *Schematic of load development.*


STUDENT AND STAFF SERVICES
Registrar's office
Admissions office
Student awards
Advisory bureau
Health service
Housing service
Athletics
LOADING
BOARD OF GOVERNORS
PRESIDENT'S OFFICE
LOADING
LOADING
ADMINISTRATIVE SERVICES
Vice-president's office
Research administration
Institutional research
Chief Accountant
Information office
Personnel office
Physical plant office

2. To provide a structure capable of assessing the resource implications of various sets of programmes and activities, just as an engineering model can be used as a basis for prediction and design.

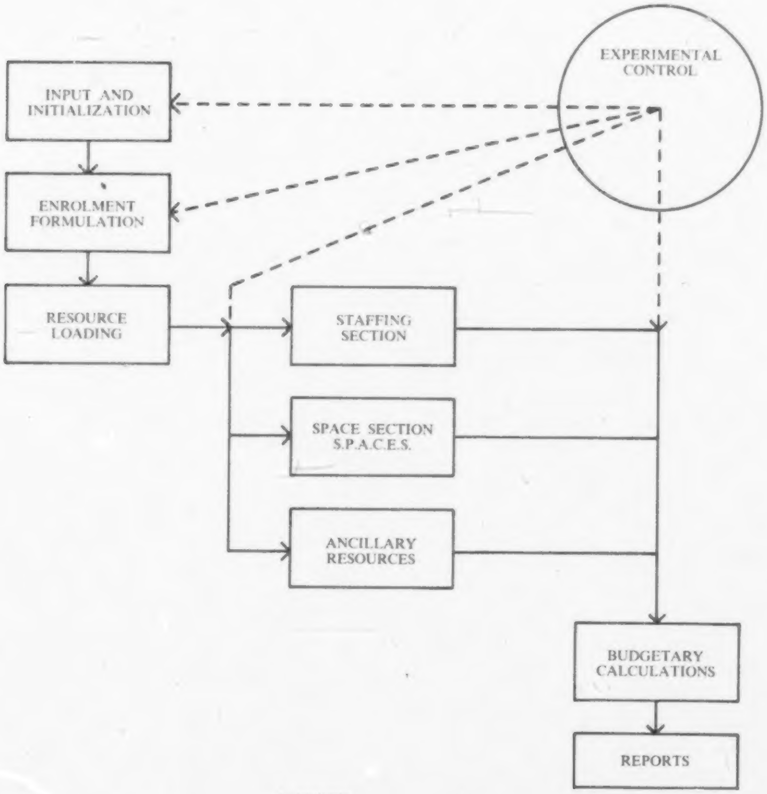

EXPERIMENTAL CONTROL
INPUT AND INITIALIZATION
ENROLMENT FORMULATION
RESOURCE LOADING
STAFFING SECTION
SPACE SECTION S.P.A.C.E.S.
ANCILLARY RESOURCES
BUDGETARY CALCULATIONS
REPORTS

FIGURE 3. *CAMPUS model: main elements.*

The CAMPUS models simulate university operations over any length of time. Loaded into a digital computer, the models accept descriptions of the university's structure (see Figure 2), of the levels of various university programmes, detailed specifications of basic activities which constitute the programmes, and various policy and planning factors concerning utilization of staff, space and other resources. With these inputs, the models compute the resulting resource requirements. (See Figures 3 and 4). These requirements are displayed by several computer-prepared reports and graphs.

Inadequacies of data having been encountered at an early stage, systems for

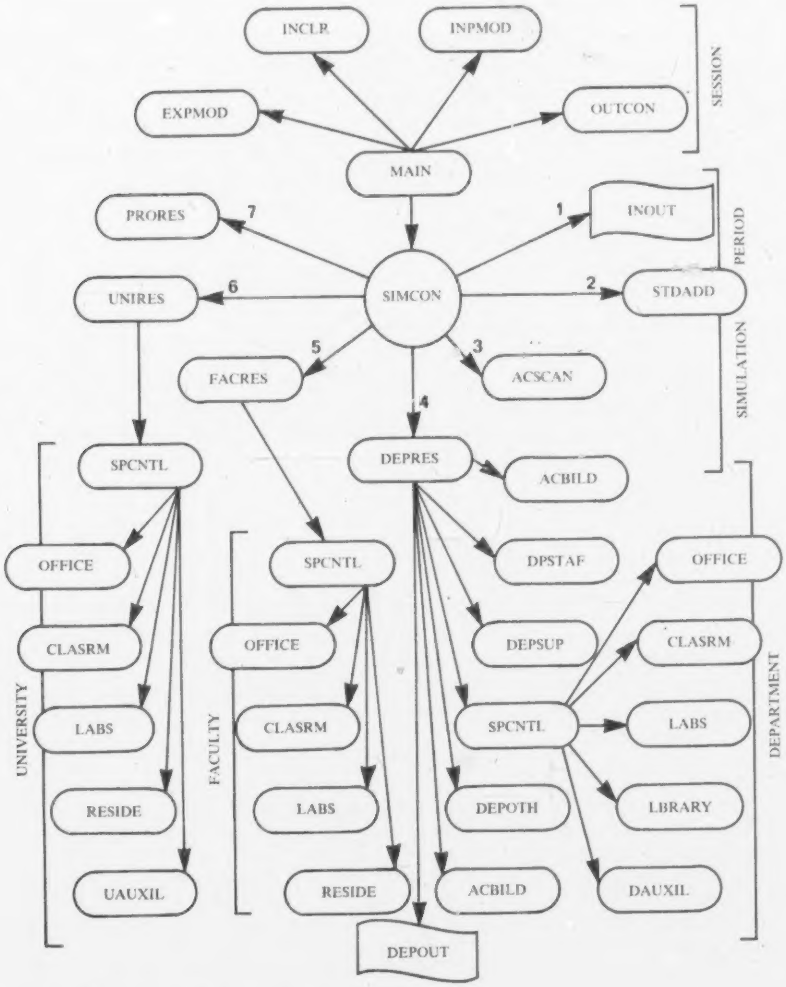

INCLR
INPMOD
EXPMOD
OUTCON
SESSION
MAIN
PRORES
7
1
INOUT
UNIRES
6
SIMCON
2
STDADD
PERIOD
5
3
FACRES
ACSCAN
4
SIMULATION
SPCNTL
DEPRES
ACBILD
OFFICE
SPCNTL
DPSTAF
OFFICE
CLASRM
OFFICE
DEPSUP
CLASRM
LABS
CLASRM
SPCNTL
LABS
UNIVERSITY
FACULTY
DEPARTMENT
RESIDE
LABS
DEPOTH
LBRARY
UAUXIL
RESIDE
ACBILD
DAUXIL
DEPOUT

FIGURE 4. *Subroutine calling sequence, CAMPUS IV.*

analysing financial information of the university were developed[1] and a series of computer routines were designed to extract information from student records. The space inventory methodology developed at the University of Wisconsin was modified and implemented.[2] [3] A survey of staff activities, which laid the basis for a faculty activity file, was carried out and various analyses of questionnaires relating to staff activity were prepared.[4]

A number of additional models were developed within the Office of Institutional Research during the first two years of its existence. A model designed to explore the implications of a proposed system of financing by the provincial Department of University Affairs was developed[5], as well as one to match space requirements as computed by CAMPUS models, against space availability, as revealed by the space inventory.[6] The Office of Institutional Research has become a vital support group for the top administration of the University of Toronto.[7] Its analytical expertise has contributed increasingly to decision-making in academic, staff, financial and facilities matters.

C. The health sciences implementation

Late in 1966, representatives of the Faculty of Medicine in the University of Toronto contacted the Systems Research Group to enquire if the CAMPUS methodology might be applied to the problems of planning the expansion and restructuring of the Faculty of Medicine. A number of major problems confronted decision-makers in the faculty.

1. *Expansion of enrolment in medicine*

The first major problem arose from a planned expansion of the undergraduate medical enrolment. In 1964, after considering alternative ways of increasing the number of medical specialists, a special committee of the University's Board of Governors recommended an expansion of the medical faculty to accommodate 250 students in the entering class instead of the approximately 175 accepted at that time. The increased enrolment was to be handled by an expansion of the basic

[1] C. L. Robinson and J. B. Levine, 'Analysis of budgetary and staffing information in the University of Toronto', Toronto, Office of Institutional Research, University of Toronto, 1967.

[2] T. DaSilva, 'Development of a space inventory at the University of Toronto', Office of Institutional Research, University of Toronto, 1968.

[3] J. V. Yurkowitch, 'A methodology for determining future physical facilities requirements for institutions of higher education', Madison, University of Wisconsin, 1966.

[4] B. L. Hansen and S. Sandler, 'Report on a study of faculty activities at the University of Toronto', Office of Institutional Research, University of Toronto, 1967.

[5] R. W. Judy, B. L. Hansen, S. I. Centner and W. Wolfson; 'Analysis of the effects of formula financing on certain universities', Part I, Summary analysis and conclusions, Office of Institutional Research, University of Toronto, 1967.

[6] W. Sceviour, 'A computer simulation model for planning instructional facilities at the University of Toronto', M.A.Sc. thesis, Department of Industrial Engineering, University of Toronto, 1968.

science departments on the main university campus and of the activities at each of the major affiliated teaching hospitals.

The Committee anticipated substantial economies of scale as a result of this expansion, that is, when compared to the cost of constructing comparable facilities in a new university medical centre for an equivalent number of students. It thought that the increased number of graduates would be turned out three to four years earlier than it would from an independently developed new medical school. Furthermore, it was expected that academic staff might be recruited more readily into the framework of a well-recognized Faculty of Medicine than to a new school.

The Boards of Governors Special Committee recognized that the enlargement of the entering class to 250 students posed special problems for maintaining and raising standards of education in the faculty, and thought that the main difficulty would be experienced in the clinical training of medical students. But it was of the opinion that 'If the clinical departments can be developed to a uniformly high standard at three or more major teaching hospitals, clinical instruction of 250 students per class could be satisfactorily handled by sub-dividing classes into three or more smaller groups, each affiliated with one teaching hospital.'

2. *Curriculum changes*

Early in 1967, after several years of discussion, the Faculty of Medicine agreed in principle to a basic re-design of the undergraduate medical curriculum.

The Curriculum Committee's basic recommendation was that 'the faculty conduct a co-operative experiment in correlated system-oriented teaching'. This recommendation, spelled out in more detail in the Committee's proposed plan, reflected considerable dissatisfaction with the traditional curriculum based upon the conventional departmental divisions (i.e. Anatomy, Surgery, Medicine, etc.). The organization of instruction by human physiological systems was expected to facilitate the teaching of basic science, patho-physiology and clinical aspects of patient care by teachers with common interests but with differing points of view.

The Curriculum Committee proposed that the curriculum should be structured on the basis of the following three interrelated periods of study: Period I: normal biology of man; Period II: disease in terms of altered human biology; Period III: patients in relation to altered biological processes. Period I would be spent largely on campus, Period II partly on campus and partly in teaching hospitals, and Period III largely in teaching hospitals.

The Curriculum Committee did not go beyond this parcelling into periods and some general recommendations about the organization of each period. In particular, it did not attempt to specify particular lectures, seminars, laboratories, etc., their times or places, their sizes or topics, or even the number of students who would participate in each of the teaching hospitals during Periods II and III. The responsibility for detailed curriculum planning was delegated to a Committee of the Heads of Departments. This Committee was empowered to appoint a 'period committee' consisting of: (i) a period co-ordinator; (ii) chairmen representing each system and/or departmental discipline being taught in the period.

Each period committee was charged to: (i) plan the curriculum and examinations in its period; (ii) submit the plan for approval to the Committee of the Heads of Department.

3. *Increase in research*

The Special Committee of the Board of Governors, in its 1964 *Report*, recommended a major expansion of research in the faculty of medicine. Its reasons for this recommendation were three-fold: (i) increased medical knowledge is a good thing in itself and, therefore, medical research is an independent objective to be pursued; (ii) the scope of medical knowledge is so great that only by being involved in research can a medical teacher maintain the high quality of this teaching; and (iii) to attract and retain high calibre staff, it is necessary to offer good research facilities and create an atmosphere conducive to continuing academic achievement. The first of these reasons is autonomous, while the second and third are motivated by a concern for achieving the instructional objective.

4. *Expansion of graduate studies*

The Special Committee of the Board of Governors felt that the need to produce physician-scientists and future teachers warranted considerable expansion in graduate studies. This includes M.A. and Ph.D. studies, career training of clinical specialists, and continuing medical education.

The training of clinical specialists has so far been a hospital rather than a university responsibility, even though faculty staff members were involved. It is now proposed that the university's faculty of medicine assume explicit financial and academic responsibility for the education, training and supervision of interns and residents.

5. *Roles of various teaching hospitals*

Eleven hospitals now participate in the teaching programme of the faculty of medicine; seven have a major involvement (see Table 1). Such broad participation carried advantages and disadvantages; on the one hand, students are exposed to a greater volume and variety of clinical materials; on the other, greater dispersion raises problems of quality control, scheduling and diseconomies of scale.

A major problem for the university is to determine the proper role for each of the affiliated teaching hospitals. The problem is complicated by the fact each hospital, quite naturally, wishes to maximize its own role in the system. Several have independently developed plans for expensive new clinical and research facilities. The cost of independent and ambitious capital investment plans replicated by several hospitals would be very high.

Government funding agencies are unwilling to finance the high capital and operating costs of excessive replication. Requests for hundreds of millions of dollars in capital grants already have been made by teaching hospitals to support their self-conceived roles in the expanded university medical programme. The

Table 1. Selected statistics of eleven hospitals associated with the faculty of medicine, University of Toronto

Institution	Type of Hospital	No. of beds as of 31 Dec. 1966	No. of patients admitted in 1966	No. of patient days of care in 1966	Millions of paid hours of work in 1966	Percentage of paid hours of work devoted to medical education in 1966	No. of medical specialists graduated (excluding doctors) in 1966	Gross operating costs in 1966 ($ millions)	Percentage of revenue from the OHSC
Toronto General Hospital	General	1 391	27 116	425 290	7.2	4.8	108	20.7	90
Toronto Western Hospital	General	851	18 556	251 998	4.3	4.8	63	12.4	92
St. Michael's Hospital	General	894	19 154	289 841	4.7	3.8	162	12.2	93
Wellesley Hospital	General	454	6 980	103 339	1.9	6.8	46	5.8	95
Princess Margaret Hospital	Cancer Institute	120	2 677	38 244	1.2	2.3	4	5.4	99
New Mount Sinai Hospital	General	373	10 938	113 257	1.7	5.6	58[1]	5.9	96
Sunnybrook Hospital	General (formerly veterans' hospital)	987	. . .	41 638	0.8	3.6	2	2.5[2]	75[2]
Sick Children's Hospital	Paediatric	848	26 224	234 958	5.2	4.5	61	15.5	94
Clark Institute of Psychiatry	Psychiatric	206	264	12 886	0.4	1.0	. . .	. . .	. . .
Women's College Hospital	General	280	8 088	83 327	1.4	2.4	51	3.8	98
Lyndhurst Lodge Hospital	Spinal rehab.	50	195	17 543	0.2	0.1	. . .	0.5	75
Total		6 554	120 192	1 612 321	29.0			(84.7)	

1. Includes Nightingale School of Nursing. 2. From 1 October 1966 only. ...Data not available.

SOURCE Ontario Hospital Services Commission, *1966 Annual Report* (Statistical Supplement), Toronto, 1967.

Government has asked the university to strutinize these plans and certify that they are necessary to meet its needs. Failure of the university adequately to discharge this obligation could lead to an unfortunate reduction in its autonomy.

6. *Staffing and remuneration policy*

The departments of the faculty of medicine and the other health sciences faculties employ staff members who provide services of instruction, research and administration to the system. Changes in the levels and mixes of outputs of the main system imply changes in staff resources.

At the present time, the faculty of medicine depends heavily on (a) staff members paid, partly, from the university budget and, partly, by granting agencies outside the university, and (b) staff in the clinical departments who receive little financial or academic recognition from the university. This latter group consists largely of clinical practitioners who, at least in the past, derived some advantage from their association with the teaching hospitals.

It is thought that the present proportion of teacher-practitioners is not a proportion for the desired quantitative and qualitative expansion of the faculty. Teaching may be given a low priority by a teacher-practitioner who is very busy with his private practice, and the desired development of research in the faculty is inconsistent with a staff mix favouring teacher-practitioners; research demands teacher-researchers. The proposal is, therefore, to shift the staff mix of the clinical departments in favour of full-time teacher-researchers. This will have important implications for the research facilities that the faculty must provide.

D. The need for analysis

From this brief survey of the major decision areas confronting leaders of the faculty of medicine, the need for analytical staff work was apparent. Early in 1967, SRG established the Health Sciences Functional Planning Unit together with representatives from the faculty of medicine. Financial assistance was provided by the Canadian Federal and Ontario governments. The unit was placed organizationally under the Vice-president of Health Sciences. Its mission has been to develop and apply techniques systems analysis to assist policy planning in the health sciences faculties.

A principal objective of the unit has been to develop models to assess quantitatively the resource implications of alternative plans and programmes. A number of CAMPUS-type models have been designed and developed by the Unit (see Figure 5 on pages 196-7). The basic models are as follows:

(i) UGEDUC—the undergraduate model
This model accepts descriptions of the professional medical teaching programme, and produces statements of resource requirements to sustain that programme. UGEDUC is similar in form and content to the CAMPUS II model.

(ii) TRAINEE—a speciality training model
This model accepts specifications of the medical speciality training programmes (intern and residency), and produces reports on the inputs of staff teaching hours and teaching patient hours for the speciality training programmes. It accepts descriptions of any programme of graduate medical education. Output from the model is provided in two forms: (i) detailed descriptions of the educational content of the clinical training programmes, and (ii) programme quality and resource analyses giving quantitative data regarding the impact of alternative training objectives upon other health care parameters, and the resources required for implementation.

The TRAINEE model has been applied successfully to the Departments of Obstetrics, Gynaecology, General Medicine, General Surgery, Psychiatry and Pediatrics—for all of which bed and staff requirements of alternative training programmes have been calculated.[1]

(iii) CIRCUS—calculation of indirect resources and complete unit staff
This model accepts statements of teaching staff hours required for the undergraduate and speciality training programmes from UGEDUC and TRAINEE. It also accepts constraints concerning staff policy objectives of the departments and staff time profiles. These inputs are submitted to CIRCUS which, using linear programming, produces statements of the numbers of staff required to meet the various constraints while minimizing any one of a number of possible objective functions, including staff members and academic salary costs. The model also produces reports on teaching and research space, and other related indirect resource requirements and dollar costs. ~~Figure 6 on page 198 displays the major~~ concepts in CIRCUS.

(iv) PRIMER—patient record information for medical education requirements
This model accepts information on patient contact requirements for the undergraduate and speciality training programmes, data on the 'generation' of patients by the community, and other patient care information. These data are combined with medically determined constraints on patient care and their ability to sustain teaching exposure. The output is the numbers of patients and teaching beds required to sustain the various programmes.

(v) CIPHER—calculation of patient and hospital education resources
This model computes the various patient and patient-care related indirect resource requirements and other costs, including teaching beds and other teaching hospital resources.

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[1] Richard Wilson, 'The dynamics of graduate medical education', Health Sciences Functional Planning Unit, University of Toronto, 1968.

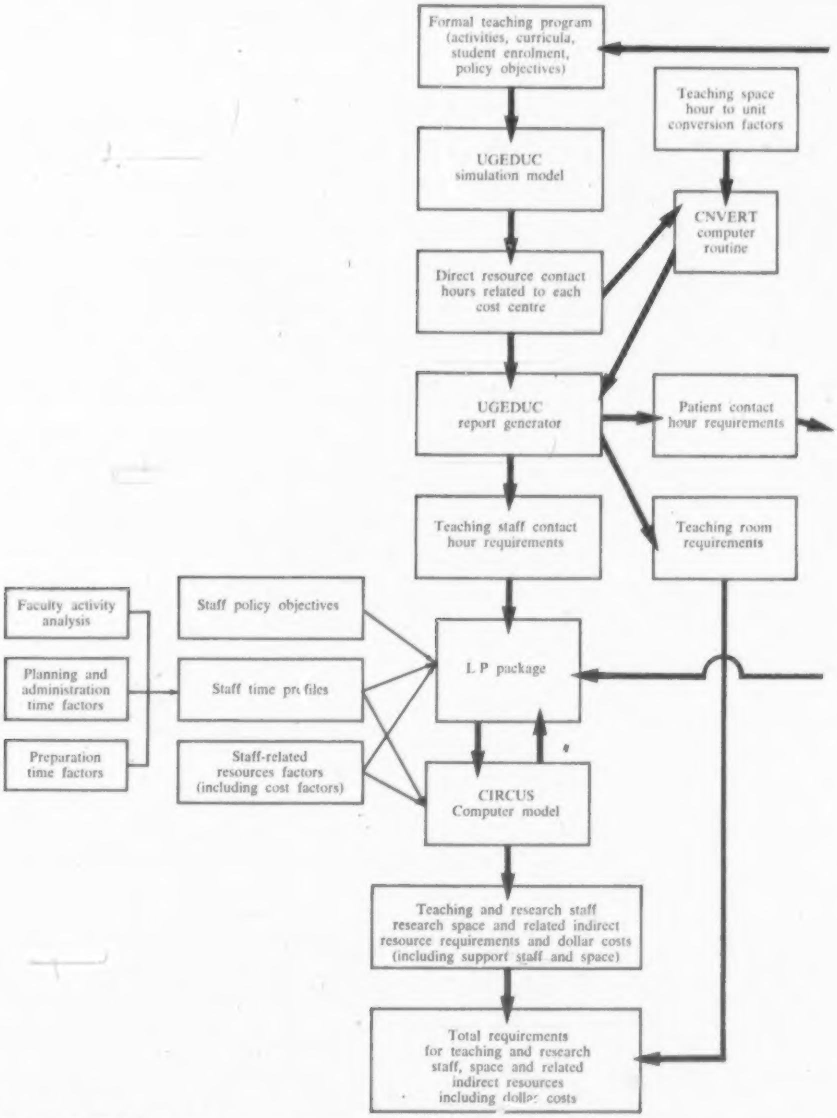
Formal teaching program (activities, curricula, student enrolment, policy objectives)
Teaching space hour to unit conversion factors
UGEDUC simulation model
CNVERT computer routine
Direct resource contact hours related to each cost centre
UGEDUC report generator
Patient contact hour requirements
Teaching staff contact hour requirements
Teaching room requirements
Faculty activity analysis
Planning and administration time factors
Preparation time factors
Staff policy objectives
Staff time profiles
Staff-related resources factors (including cost factors)
L P package
CIRCUS Computer model
Teaching and research staff research space and related indirect resource requirements and dollar costs (including support staff and space)
Total requirements for teaching and research staff, space and related indirect resources including dollar costs

FIGURE 5. *Health sciences resource requirements: simulation models systems flowchart.*

(b) Total cost implications

It might be thought that one of the results of the operation reviewed would be a saving of resources, since if it had not been carried out the costs of accommodating the 1968 enrolments would have been substantially higher. This is not, however strictly true, since the Chilean education authorities had declared any expansion of technical education enrolments *unfeasible if* it required a budgetary increase: what actually happened was that the operation made the 'unfeasible' feasible.

However, to be able to evaluate in some way the money value of the operation, it is relevant to point out on the one hand that, had no changes been made in teacher utilization, 62,125 teacher-hours would have been necessary to cater for 49,428 students, i.e. nearly 15,700 more than those actually required (see Table 4). Therefore, the improvement in teacher utilization enabled the government to economize to the extent of about 22,400 million escudos. We can suppose that some measure of improvement would have taken place even without the redistribution exercise—say 4,000 out of 7,355 'idle' teacher-hours would have been re-allocated to teaching in 1968. In that case, it would be more correct to estimate the economies resulting from the operation itself as about 17,600 million escudos.

On the other hand, we can estimate very crudely that due to under-utilization of teachers 15,770 million escudos, or 26 per cent of the 1967 expenditure in teacher salaries, was money badly invested.[1]

Obviously these figures are significant not in themselves but in terms of opportunity costs; that is, financial economies mean more teachers, more grants or teaching aids in other sectors of the educational system. For example, according to our data, economies amounting to 11,899 million escudos arising from the increased size of classes (see Table 5) would be sufficient to pay the salaries of 'other personnel' (administrators, headmasters, etc.) for accommodating a student population as big as that of all industrial, commercial and specialized state schools. This same amount would permit grants (food and lodging) to be given to 11,970 technical education students or would finance recurrent expenditure for 29,673 students in basic education.[2] This is a crude, although illustrative, indication of the real costs of inefficiency in the present case.

3. *Remarks on qualitative results*

Studies of efficiency are concerned with the relationship between the product of a system and the inputs used to produce such a product. When studying the efficiency

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[1] We have assumed that teacher costs per student in 1967 would have equalled those of 1968 (increases in average teacher salary deducted) if teacher 'productivity' in 1967 had been at the improved 1968 level—i.e. 1,214 escudos. On the basis of this unit cost, total expenditure in teacher salaries in 1967 would have needed to be only 44,256,379 escudos instead of the observed 60,027,360 (at constant 1968 prices). See Table 4.

[2] At a cost of 994 and 401 escudos per student respectively (estimated figures).

4

TABLE 5. 'Economies' which resulted from the measures taken to achieve a better utilization of teachers in industrial, commercial, and 'specialized' state technical schools

Items	Resources needed for an enrolment of 49.428			'Economies'	
	1 With the measures (1968 actual)	2 With half measures[1]	3 Without measures[2]	2-1	3-1
Number of teacher-hours (per week)	53 781	62 125	69 480	8 344	15 699
Total annual expenditure on teachers' salaries (in escudos)[3]	76 700 000	88 599 569	99 088 902	11 899 569	22 388 902

1. Size of courses as in 1967: 29.9 students; full utilization of teacher-hours in the appointment.
2. 62.125 plus the 7.355 surplus teacher hours existing in the appointment in 1967.
3. At the average hourly wage rate of 1968.

SOURCE Table 3.

of an educational system the educational planner is concerned not only with improvements in the utilization of school resources but also with the quality of the output, i.e. learning results.

In the case reviewed here, educational efficiency has been improved by producing a larger output with a given amount of teacher input. Measurement of the quality of such output was, however, beyond the scope of the Secretariat's work; but an implicit assumption underlying the whole exercise must be mentioned. It was assumed that the changes to be made would not alter, or at least would not diminish, the quality of learning. This seems a sensible assumption. First, there is the fact that after the re-distribution measures all teachers would be expected to teach all the hours for which they had been appointed. It does not seem that the teaching load of the Chilean teachers in technical education has significantly increased in *average* terms as compared with 1967, when the 'idle' teacher-hours were proportionately few. Secondly, the average size of courses in 1968—34.5 students per course—was not significantly higher than the 29.9 observed in 1967. It is true that this may conceal vast differences between large and small schools as well as between the various forms and branches of studies. However, the spirit of the re-distribution measures was to eliminate existing under-populated courses rather than overcrowd existing large courses (see Table 2). It is true that current educational ideology states that increases in the size of classes tend to lower teaching results; however, it must be remembered that research in this field has not yet reached any conclusive findings on the 'pure' effect of size of classes on achievement as compared with other relevant factors such as student social background.[1]

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[1] See for example: (i) Department of education and science (U.K.), *Children and their primary schools*, London, H.M.S.O., 1967; (ii) OECD, *Economic aspects of higher education*, Paris, 1964, p. 39; (ii) J. S. Coleman *et al.*, *Equality of educational opportunity*, U.S. Department of health, education and welfare, Washington, 1966.

4. *Modifications to the existing system of teacher appointment*

As a result of the experience drawn from the operation, the system for appointing teachers was modified in 1969. The changes aimed at improving the key elements in the system—that is, norms for appointing and re-distributing teachers, administrative practices, communication and information channels between schools and the central administration and the supervisory system—so as to ensure a more efficient utilization of teachers. The main features of the new system are as follows:

1. Headmasters are instructed before the beginning of the school year about the *norms they should follow for appointing and re-distributing teachers* in their schools. The 1969 instructions to headmasters explicitly state that 'the experience drawn from the process of implementing the educational reform has suggested the need for stating criteria and norms to distribute teaching staff in order to fully utilize the human and economic resources available'. Two basic norms are stated: (a) the minimum size of classes, as discussed earlier, and (b) a standard scale to be used for selecting candidates for particular teaching assignments—either among teachers who have to be reallocated[1] or candidates for vacant or new posts. The scale provides a certain standard weighting according to the various types and levels of diplomas and training-course certificates that teachers may hold, their type of appointment *(propietario* or *interino)* and their years of service as teachers in technical education. It distinguishes between theoretical and workshop teaching; educational background is given greater weight than seniority.[2] Moreover, other relevant procedures and criteria are stated, for example, how and when a teacher who had been transferred to a basic general school can be transferred back to his original school. Headmasters are expected to contact other schools in the area to better complete their task.
2. As during the operation, headmasters have *to inform* the Directorate in detail about the school situation in terms of teacher capacity, re-allocations of teachers, and new appointments needed.
3. Each school has established a '*Co-ordination council*' formed by representatives of its teachers and the headmaster. It is responsible, together with a representative of teacher trade unions, for *classifying the teaching staff and candidates for new posts* according to the aforementioned scale.
4. Representatives of the Directorate held *meetings with headmasters* before the beginning of the school year in order to give further instructions and, particularly, to comment on possible prospects for the school year and discuss particular problems. The organization of these meetings was much improved as compared with 1968, by holding regional, instead of national, meetings assembling from three to five provinces each, covering between fifteen and forty schools.

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[1] In 1969, the 'old' fourth form had to be 'transformed' into the new second form.

[2] The scale would probably be improved as a criterion for selecting teachers for technical education if it gave some consideration to teachers' working experience in industry.

5. In order to meet the administrative requirements of the operation, a team of three had been established in 1968 at the Directorate of Technical Education, in charge of *examining the teacher appointments proposals and giving advice accordingly to the Director.* In 1969 this was developed into a 'Unit for rationalization and distribution of school staff', comprising a four-member team. The unit advises the Director on the basis of a detailed analysis of each school. It works with information on the technical education budget approved for the current year, the list of teachers, figures for teaching capacity, enrolments and classes in each school and area (provided by means of 2,4 and 6), and curriculum specifications. The team is well acquainted with current administrative regulations and established norms and procedures and has close contact with the Planning office.
6. As far as *supervision* is concerned, the Directorate has established a team comprising school supervisors, teachers seconded to the Directorate, representatives of various departments, and advisers to the Director, which is designed to supplement the under-staffed supervisory system. They visit individual schools in groups of two or three, acting as a bridge between the schools and the central administration. They are concerned with controlling the implementation of the Directorate instructions and helping to solve particular problems.

V. Conclusions

This study has been concerned with the set of measures taken by the Directorate-general of technical education in Chile between March and April 1968, designed to improve the existing utilization of teachers. We have tried to show the problems which needed to be overcome; the study does not intend to criticize but to draw some general lessons from the Chilean experience for other countries.

The experience gained during the exercise and the results achieved seem particularly relevant for countries with a centralized administrative system and those sectors of the educational system working with relatively low student/teacher ratios, for urban schools, and also for countries which are introducing educational reforms.

The need for *ex-ante* studies of educational reforms designed to predict their implications in terms of costs, supply of teachers and physical facilities, administrative arrangements, etc., has been frequently emphasized. Educational reform as distinguished from sheer educational expansion means that a certain number of existing teachers (and other resources) must be re-allocated. This study suggests that this requires a careful preparation. For example, what are the needs of the new structure in terms of numbers as well as types of teachers, to what particular schools will teachers be transferred, etc. We have also observed that re-allocations of teachers are affected by particular *constraints* such as the lack of 'fit' of teachers' specialities with new specialities in the curriculum, and teachers' resistance to change of jobs, schools or areas. Moreover, if the reform leaves—as in the present case—teachers without teaching assignments, surpluses cannot always be reduced by discharging teachers. In this case they were in Chile in a relatively fortunate position, since the efficiency measures were taken in the context of a very fast expansion of enrolments. That is, although in 1968 schools were still somewhat overstaffed this could be solved in the near future if the present policy is continued due to expanded enrolments. In countries with a slower rate of educational expansion, the practical problems posed in relation to obligations to teachers can be more difficult to overcome. All this illustrates once more, as applied to the case of teachers, the need for careful preparation of educational reforms in order to introduce them in the most efficient way.

The study has also shown that the efficient use of teachers requires that the system for appointing new teachers and distributing existing teachers between schools should fulfil certain conditions.

In Chile the new system, established as a result of the change in policy, fulfilled the following prerequisites:

1. Clear-cut *norms* should be set by the central administration to be followed by headmasters in distributing existing teachers and making proposals for new assignments.
2. Means for regular collection of relevant *information* on schools should be developed.
3. *Administrative procedures* should ensure first that such norms are taken into account at the decision-making level when teachers are appointed. Secondly, regulations should allow for the maximum possible interchangeability of teachers and vacant posts between schools, types of education, areas, etc.
4. Adequate *supervision* should be provided. Supervision should aim not only at controlling the implementation of norms but also at helping schools to solve problems and act as a bridge between schools and the central administration.
5. As far as *headmasters and teachers* are concerned, they should participate in the process of appointing teachers. This recognizes the fact that headmasters have a first-hand knowledge of schools' needs and their resource capacity and can thus play an active role in ensuring efficiency. The 'headmasters' meetings' and the schools' 'Co-ordination councils' are a step in this direction.

In the case reviewed, the norms which we have already discussed cover two main elements, minimum size of classes and a standard scale for ranking teachers according to their qualifications (as well as criteria for re-allocating teachers to fit in with the changes brought about by the educational reform). However, these are only two among various other factors affecting teacher utilization, such as teachers' teaching load and conditions of service, functions which teachers perform (including teaching and non-teaching duties), use of teaching aids etc.,[1] which a system of teacher appointments concerned with efficiency should also take into account.

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[1] See the bibliography list for reading material on this subject, particularly (2), (3) and (5).

The study has shown that in spite of the fact that the efficiency operation was modest in scope and simple of methods, it achieved significant results in terms of teachers' productivity, unit and total costs.

It is acknowledged that in order to assess the effect of the operation in terms of teachers' productivity it is necessary to measure its effects on learning results as well as on quantitative output. However, under the assumption that the quality of teaching has not been significantly altered, the output (enrolments) was increased by as much as 35 per cent as a result of increased efficiency in the use of teacher inputs. This meant that the productivity per hour of teachers employed—in terms of number of students taught—increased by 33.7 per cent. Accordingly, teacher costs per student and thus total recurrent costs per student were reduced in 1968, in spite of the fact that teachers' average salaries had increased as a result of an increase in salary scales.

It seems that educational planners in countries with low student/teacher ratios might be more directly concerned with the results of this experience than those with over-populated classes. It is also clear that this applies more directly to countries where the supply of teachers is abundant—a phenomenon which tends to go together with low student/teacher ratios. However, the results have a more general relevance to the extent that they vividly illustrate how efficiency studies and measures—even if simple—can be a good way to escape from financial constraints or, in other words, to achieve aims that otherwise would have been difficult to achieve. Moreover, the accomplishments of efficiency studies and measures become particularly significant if regarded in terms of alternative use of resources. That is, increased efficiency means that substantial economies can be achieved. In the present case such economies would have made it possible, for example, to employ sufficient headmasters, administrators and teaching assistant personnel for a student population as big as that of all the schools covered by the operation. This is a crude approximation of the opportunity costs of efficiency.

Finally, since in most countries teacher salaries account for a large share of total recurrent expenditure in education, the experience reviewed supports the idea that studies on teacher productivity are a significant area for further study. In view of this fact, it is highly surprising to find that research on the utilization of teachers is largely 'underdeveloped' as compared with other fields of research.[1]

It would appear that the establishing of teams devoted to the study of educational efficiency, although it might seem a costly practice at first sight, could be a rewarding investment.

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[1] Much more has been done in the field of utilization of physical facilities in schools and efficiency of school buildings. See for example M. Woodhall, 'United Kingdom: the use of cost analysis to improve the efficiency of school building', on page 147 of this volume.

TABLE 1. Enrolments in kindergarten, primary and secondary education, 1962–68 (public schools)

Type of school	1962	1963	1964	1965	1966	1967	1968
1. 'Parvulararia'	32 218	33 379	36 234	43 530	41 336	43 235	43 907
2. Primary and basic							
1–6	910 916	913 324	954 916	1 110 333	1 153 585	1 202 029	1 257 605
7–8[1]	76 186	83 146	89 169	103 413	145 539	180 332	189 050
3. Vocational	23 826	23 947	25 842	29 910	22 831	16 504	...
4. Secondary[2]	80 303	86 226	93 499	100 928	113 558	130 998	167 625
5. Total	1 123 449	1 139 572	1 199 660	1 388 114	1 476 849	1 573 098	1 658 187
6. Of which state technical schools							
7–8[1]			29 606	33 806	38 214	1 821	520
Secondary[23]			26 967	29 125	33 178	40 349	55 667

[1] First and second forms of secondary education up to 1965.

[2] Third and higher forms of the old structure up to 1967.

[3] 'Escudas Consolidadas' following on from basic education.

SOURCE Ministry of education.

... Data not available

TABLE 2. GDP, total public expenditure and public expenditure on education, 1964–68 (million escudos)

Items		1964	1965	1966	1967	1968
1. Public expenditure in education	current prices	417.0	666.6	951.4	1 391.5	1 961.2
2. Total public expenditure		2 852.0	4 841.9	6 555.4	7 512.2	9 631.7
3. 1 as percentage of 2		14.6	13.8	14.5	18.5	20.4
4. Public expenditure in education	constant 1965 prices	539.9	666.6	786.8	915.6	956.7
5. GDP		16 864	17 956	19 769	20 088	20 000
6. 4 as percentage of 5		3.20	3.71	3.98	4.56	4.78

SOURCE Ministry of education, Economic department and ODEPLAN.

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USSR *26*

Comparative costs and efficiency of full-time and part-time education

prepared by V. Zhamin *and* B. Remennikov

This case study was prepared at the request of the IIEP by V. Zhamin, Rector, Lenin Pedagogical Institute, Moscow, and Boris Remennikov.

I. Public expenditure on specialist training

With almost five million students enrolled in the 785 universities and institutions of higher education in the USSR, the expenditure on the training of highly qualified specialists is considerable. The greater part of this outlay comes from the USSR state budget,[1] whose contribution has risen from 1,167 million roubles in 1960 to an estimated 2,400 million in 1970.[2]

As might be expected, expenditure on training increases with the level of qualification. If expenditure on training a skilled worker in industrial, building, mining schools, etc., is taken as 100, then expenditure on training a highly-skilled worker in technical schools and schools of mechanized agriculture is 104–116, expenditure on training a specialist with secondary specialized education is 147–159, and expenditure on training a specialist with higher education is 259–321.

The above figures have been obtained by multiplying the average annual cost of tuition and maintenance of the student by the number of years of schooling. The average annual cost, in its turn, is obtained by dividing current expenditure by the average annual enrolment. In this calculation, capital expenditure is only partly taken into account, since the outlay on new buildings and equipment is spread over several decades. The average annual cost per student thus takes account only of the annual cost of wear and tear of buildings and equipment. This amounts to an estimated 2.2–2.5 per cent of the cost of buildings and equipment. Repairs are considered as restorations prolonging the life of the installations, and their cost is not included in expenditure on students.

The average annual number of students enrolled in a given institution is calculated on the basis of coefficients established by the Ministry of finance. On this basis, a full-time (day) student is equivalent to four evening course students and to ten correspondence course students. Applying these coefficients, we obtain the average annual contingent of students.

Thus $$S_s = \frac{T}{K}$$

where

S_s = average annual cost of maintaining a student;
T = current annual expenditure of the institution;
K = average annual contingent of students.

The current annual expenditure of the institution of higher education, T, is

$$T = R - (P + C)$$

where R = total annual expenditure on the maintenance of the institution;

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[1] See the companion case study in Volume I of this series, 'USSR: Economic planning and the financing of higher education', table 4.

[2] Exchange rate July 1969: 0.90 roubles = US$ 1.

P = expenditure on equipment and inventory items;
C = expenditure on repairs.

and the average annual contingent of students, K, is

$$K = D + \frac{25V}{100} + \frac{10Z}{100}$$

where

D = number of full-time (day) students;
V = number of evening students;
Z = number of correspondence course students.

Thus the average annual cost of maintaining a student, S_s, is

$$S_s = \frac{R - (P+C)}{D + \frac{25V}{100} + \frac{10Z}{100}}$$

In order to obtain the average cost of training a specialist, S_p, the average annual cost of maintaining a student is multiplied by the number of years of the course, L.

Thus $$S_p = S_s \times L$$

However, the actual cost of training a specialist will be higher than indicated by this formula owing to drop-out. A more accurate method consists in dividing the current annual expenditure of the institution, T (on a yearly, five-year or some other basis) by the number of students actually graduating, V_c.

Thus $$S_p = \frac{T}{V_c}$$

Table 1 shows the average cost of maintaining and training specialists in all the pedagogical institutes of the RSFSR during the period 1956–67.

TABLE 1. Average cost of maintaining and training specialists in pedagogical institutes, 1956 and 1967, in the RSFSR

	1956	1967
Current expenditure on teacher training (million roubles)	86.1	134.9
Average annual number of students (thousands)	142.1	196.0
Average annual cost of maintaining a student (roubles)	606	698
Number of graduates (thousands)	25.7	31.5
Average expenditure per graduate (roubles)	3 350	4 283

SOURCE V.A. Zhamin, *Ekonomika obrazovanija* (Economics of Education), Moscow, 1969, p. 291.

The increase in the annual average cost per student and in the average expenditure per graduate produced is due to several factors, mainly to an increase in salaries of the staff in pedagogical institutes and to higher grants for students. However, the cost of training teachers differs from one institute to another, as illustrated in

Table 2 which shows the costs in the institutes of Leningrad, Kalinin, Lipetsk, Krasnodar, Volgograd and Celjabinsk in 1966.

The differences in costs are due to several factors, among which the length of training is the most important. Most of the faculties of the Leningrad Institute, for instance, provide a five-year course, while most of the faculties of the Kalinin and Celjabinsk Institutes provide a four-year course. Also, the number of the teaching staff with high qualifications and titles—and high salaries—varies from one institute to another. Lastly, the cost of training specialists depends on the manner in which available funds are used.

It should be pointed out that part of the resources received by institutions of higher education from the budget are not included in expenditure on education proper. Expenditure on research, for instance, is considered as an item of public consumption, and is not included in the cost of specialist training.

TABLE 2. Average expenditure on the training of a specialist in various pedagogical institutes

	Leningrad	Kalinin	Lipetsk	Krasnodar	Volgograd	Celjabinsk
Current expenditure on teacher training (in thousand roubles)	5 361.6	1 437.7	620.7	2 195.1	2 104.3	1 734.3
Average annual number of students	6 218	2 377	1 100	3 290	3 122	2 766
Average annual cost of maintenance of one student (roubles)	862	604	564	667	674	630
Number of graduations	1 039	369	162	607	554	574
Average expenditure per graduate (roubles).	5 160	3 894	3 831	3 614	3 798	3 021

SOURCE V.A. Zhamin. *Ekonomika obrazovanija* (Economics of Education), Moscow, 1969, p. 291.

II. Factors determining the cost of full-time specialist training

The cost of producing highly-qualified specialists is an index of the economic efficiency of a higher education system. It is, therefore, important to look at the elements which make up this cost.

Institutions of higher education draw on the funds allocated to them to provide (a) free education, including tuition, the use of laboratories, libraries, etc., and (b) material benefits, i.e., maintenance, in the form of scholarships, accommodation, medical care, facilities for physical culture, etc.

But the calculation of the actual cost must also take account of failures and repeats. The number of students who drop out from full-time training represents 5 to 7 per cent of the total. If we apply the method devised by Tul'cinskij,[1] the cost of training a specialist in universities and institutions with five-year courses during the period 1962–66 can be broken down as follows (in roubles): tuition, 2,830; maintenance, 1,430; loss due to drop-out and repeats, 180; total, 4,440.

In addition to the funds provided from the state budget, a considerable part of public expenditure on training specialists with higher education consists of funds provided by industrial enterprises, *sovkhoses*, *kolkhoses*, commercial organizations, co-operatives, etc., which award from their own resources scholarships to students selected by them. Such scholarships represent roughly 70 million roubles per year. In addition, these enterprises and organizations bear the cost of the production, training of students, providing lodgings, work clothes, food, transport to and from work, wages of the instructors, etc.

It should also be borne in mind that while they are engaged in full-time study, students take no direct part in socially productive work, and thus deprive the community of a certain part of the national product. This is another element which must be added to the cost of specialist training, though it must be remembered that not all the students involved would be engaged in productive work, their activity being dependent on age, health and other factors. Moreover, account should also be taken of the income produced by the full-time students during the period of their production training and through certain other forms of activity.

According to Tul'cinskij's study, the cost to the national economy of full-time training of a specialist in a university or institute with a five-year course during the period 1962–66 was as follows: expenditure by the institution of higher education, 4,440 roubles; expenditures by enterprises, organizations and other sources, 1,670 roubles; total, 6,110 roubles. This, of course, is an average figure, for the real cost varies from one establishment to another. Such factors as the length of courses, the qualifications of the teaching staff, the profile and organization of the institution of higher education, the way in which it uses its resources, etc., vary from one institution to another and affect the cost of training in consequence.

III. Factors determining the cost of part-time specialist training

Apart from full-time training, there is also part-time training, through correspondence and evening courses, of those who are already in employment. In 1967, twenty-nine correspondence and evening institutes and 1200 correspondence and evening faculties (departments) were training in this way almost 2.4 million students. Many workers and collective farmers have, through this system of part-time training, become engineers, doctors, teachers or agronomists. The factors which determine the cost of this training are themselves determined by the characteristics of this form of education, the most important of which is that students can pursue their studies whilst following their normal occupation.

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[1] L. I. Tul'cinskij, *Finansovye problemy professional'nogo obrazovanija v SSSR* (Financial problems of vocational education in USSR), Moscow, 1968.

Under the correspondence system, students do not attend except for examinations and laboratory work. They may, at their own request, attend their institution between examinations for study, lectures, practical or laboratory work, or consultations. Obviously, in these circumstances, expenditure on staff is much lower than in full-time education, as is also that on school premises, accommodation, equipment, etc.; moreover, there is no need for scholarships. Evening courses have more in common with full-time training, except that they are much less costly, mainly because compulsory attendance at the institution is less and there is no need for scholarships.

The cost to the national economy of part-time specialist training is naturally included in the expenditure on higher education and that of various enterprises. The method of calculating this cost in universities and institutes which provide part-time education only is similar to that for full-time education. But, as a general rule, universities and institutes provide both full-time and part-time education, and this complicates the calculation, since many items of expenditure are not set out separately for each of the two types of training. We must then apply coefficients, on the basis of which, as has been shown earlier, one full-time student is equivalent to four evening course students and to ten correspondence course students as far as costs are concerned. However, these ratios do not take into account the costs incurred through failures to complete the studies. While in full-time education these failures amount to some 5 to 7 per cent, in correspondence education, the figure is almost 50 per cent. Such high wastage means, of course, a doubling of the cost of training a specialist.

In order to determine the cost of producing highly-qualified specialists by correspondence courses and to find ways of improving the efficiency of this process, a survey was conducted in 1964/65 of 3,000 students enrolled in the correspondence departments of the Universities of Leningrad, Byelorussia and Tashkent.[1] It revealed that some 20 per cent of correspondence course students completed their studies two years later than planned under a five-year course, thus raising the costs by 20 per cent. The data provided by the survey on the actual expenditure on one correspondence course student from the beginning to the end of his studies showed that the cost of a full-time student is equivalent to only four times that of a correspondence course student (and not ten times as previously calculated).

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[1] For the results of this survey, see B. Remennikov, *Ekonomiceskie problemy vyssego obrazovanija v SSSR* (Economic Problems of Higher Education in the USSR), Moscow, 1968.

But the total cost of part-time specialist training must include not only the expenses borne by the educational institution, but also those of the various enterprises and organizations which accord advantages to their workers and employees who pursue part-time education whilst following their normal occupations. These latter expenses are by no means negligible and represent a considerable part of the total public support for specialist training. In this connexion, the decree of the USSR Council of ministers stipulates that leave with pay shall be accorded to part-time students for examinations and laboratory work. Out of a total of 300 calendar days paid leave for the total duration of the course, thirty days are accorded during courses I and II, forty days during courses III and IV, and four months during course V, which includes theoretical and practical work for the diploma thesis and state examinations. In addition, during the ten school months prior to the thesis and examinations, worker-students get one day per week at half pay and a further one or two days per week without pay; they may also receive one month's leave without pay during which they get a grant from the state. The average monthly wage of correspondence course students being, in principle, 100 roubles (the majority do, in fact, receive a higher wage), the total amount of expenditure by enterprises and organizations, in respect of paid leave can easily be ascertained. In addition, the enterprises bear half the cost of the annual journey of their correspondence course students to and from the educational institution in which they are enrolled, the cost of the free supply of machines and equipment to these educational institutions and of textbooks and educational material for their worker-students. But it should be borne in mind that the enterprises and, indeed, the national economy as a whole receive a certain income from the production output of the students concerned. This must be taken into account when calculating the costs of specialist training, though such calculations can only apply with regard to students who *are* engaged in material production and thus contribute to the surplus product. The labour of correspondence course students who work outside the materially productive sphere does not lend itself to comparative measurement, though this is not a reflection on the effectiveness of such forms of socially useful labour.

When all these considerations are taken into account, the cost of part-time training of specialists is somewhat lowered but, even so, the total public outlay on such training considerably exceeds the expenditure set down as a norm.

IV. Comparative efficiency of full-time and part-time (correspondence) training

Any assessment of the efficiency of different forms of specialist training must include not only a comparison of costs, but also an analysis of the quality of training and of the work productivity of the graduates involved. In this connexion, it should be noted that graduates from full-time education are, on average, five to ten years younger than those graduating from evening or correspondence courses, and that they enter the production process at a much earlier age than the latter. They lack, however, the production experience of the graduate from part-time education and take some time to become fully 'operational'. On the other hand, specialists from part-time education, though they have generally greater practical experience, tend to lag behind graduates from full-time education in theoretical knowledge. This is shown in the reports of the examination boards, which point to the rather high number of part-time students who fail to secure satisfactory marks in theoretical subjects.

However, the quality of part-time training is not always lower than that of full-time training. The same reports show that part-time students often reveal a greater depth of knowledge than full-time ones, particularly in humanistic subjects. The fact that many students are transferred, before completing their education, to posts requiring higher qualifications, and thus a corresponding degree of training, is not without significance in this respect. Thus 554 of the 3,000 students included in the survey referred to above were working, at the time they entered university studies, as teachers in secondary schools. During the period of studies, this figure rose by almost one third, to 733 at the time of the survey. Most of the students making up this third had previously been workers or employees. Approximately one-tenth of the students were subsequently employed as engineers and technicians.

A number of students, while receiving education by correspondence, take up work corresponding to their future specialization, and this tendency is indicative of the usefulness of such education. There is also a tendency on the part of correspondence course students in technical, agricultural and other institutes to assume greater responsibility than full-time university students, probably because their education is more closely related to the vocational training already acquired.

A comparison of the efficiency of full-time and part-time education is greatly facilitated by the survey mentioned above. The average age of the correspondence course students was 27, and the overwhelming majority had considerable practical experience, mostly in the same enterprise. Moreover, 84.3 per cent were also engaged in some other form of social work and had thus acquired some experience of working with other people, something which is necessary for every specialist. Providing such people with higher education is advantageous, because they will 'repay' their training more quickly than those who enter higher education without experience of productive work and of life itself.

It should be borne in mind, however, that the length of such 'repayment' and, indeed, the effectiveness of part-time training are the more reduced the higher the age at which correspondence course students start their education. Nor should one forget the large amount of public expenditure involved in this kind of training. On the other hand, this method produces a considerable number of specialists without any significant loss of productive work and has the great advantage of being universally accessible, enabling many people to receive higher education which otherwise they could not have had. For all these reasons, part-time higher education is of great social and economic value, since it permits raising not only the cultural level, but also the technical capacity of the nation.

V. Keeping part-time university education up to date

The rapid development of science and technology makes it necessary to keep the teaching constantly up to date in part-time as well as in full-time higher education. As far as the latter is concerned, a number of measures have lately been introduced with this end in view. In order to reduce the distance between the place where part-time students live and work and the establishment from which they receive their education, the correspondence departments of the latter have been provided with a broad network of subsidiaries and consultation centres, many of them set up on the premises of large enterprises, *sovkhozes*, research establishments, etc. Provision is also being made in the plans of industrial, agricultural and transport complexes to build classrooms, laboratories and other facilities to be used by the correspondence and evening course departments of higher education, the capital investment required being made available from the corresponding branch of the national economy. This element must also be taken into account when computing the cost of training.

Another important problem is that of literature. It is a well-established fact that the level of theoretical knowledge of correspondence course students depends largely on the educational literature with which they are provided, and the failures of many students can often be attributed to this factor. Consequently, higher education institutions now have to provide each of their correspondence course students, at the beginning of each academic year, with full sets of textbooks, material and educational and methodological documentation, including a work plan for the year and time-tables and instructions for each of the disciplines to be studied during the year. This material is prepared by the most highly qualified members of the teaching staff.

Another valuable means of enhancing the educational process and increasing the efficiency of part-time training is educational cinema, television and similar technical aids. Considerable progress has been made in this direction. Some 1,500 educational films are now available to the departments of part-time education, and fifteen new films were made in 1968 alone. This naturally necessitates the setting up of several thousand projectors.

Increasing use is also made of educational television. In 1969, television classes were being held in twenty-two towns having higher educational institutions. Televised courses for the first three years of the *Vuz* (higher technology institutes) are given by the most qualified lecturers in mathematics, physics, chemistry, descriptive geometry, theoretical mechanics, etc. A number of establishments transmit educational programmes for their students on a closed circuit from their own studios.

There is also a wide utilization of technical aids and of programmed teaching. Almost one hundred institutions of higher education are using such teaching and testing devices, which make it possible to keep a constant and automatic check on the students' assimilation of the material taught, to determine his preparedness for laboratory and practical work and examinations, and to supervise his work.

Particular attention is paid to the qualifications and experience of the teachers of correspondence courses, for it is this which largely determines the quality of the education given to the students, particularly with regard to consultations and laboratory work. It has been found that the level of training is highest in the correspondence departments which employ the most qualified and experienced teachers.

Lastly, let us point out once more that an important factor in the part-time training of specialists is the relationship between the chosen field of higher study and the nature of the student's occupation in the production process. Our survey has shown that the great majority of failures occur where there is no relationship between the two, particularly, in the field of mathematics, mechanics, biology and philology. Education by means of correspondence courses would be much more efficient if greater attention to this relationship were paid in the selection of students.

VI. Relative costs and efficiency as criteria for decision-making

The enormous expansion of education in the USSR—between 1950 and 1966, expenditure on education increased threefold, to reach 16,200 million roubles—makes it all the more necessary to achieve a maximum result with a minimum of outlay, in other words, to use the available funds with the greatest possible efficiency, a consideration to which a socialist society is far from indifferent. In this respect, an important role devolves upon the relative costs and efficiency of specialist training in the various types of higher educational institutions. These are major considerations in the definition of the structure of specialist training, the fixing of student quotas for the different specializations and the different types of education, and in deciding on the form of training, its content and duration. The structure of specialist training and of higher education, in general, reflects economic, social and cultural requirements of the Soviet Union, and is constantly modified in accordance with changes in the structure of production.

The following figures on the distribution of graduates from universities and institutes in 1967 throw light on the nature of the training provided: engineering and technology, 40 per cent; humanities, pedagogy and natural sciences, 45 per cent; medecine, 7 per cent; agriculture, 8 per cent.

The high proportion of engineering and technology graduates reflects the rational character of higher education in the USSR; that of graduates in humanities and pedagogy, the demands of the cultural revolution and the basic principle of universal literacy and universal secondary education. The scientific revolution demands that the highest priority be given to specialist training in the natural sciences, and this, in turn, requires university education on a larger scale. In the last fifty years, the number of universities has increased almost fourfold, the number of students, more than ten times. Considerations of cost and efficiency have naturally been given particular attention in deciding what the distribution of students should be between specializations and between the various types of education.

As already pointed out earlier, part-time training of gainfully employed students has been greatly expanded. In 1968, rather more than half of the students enrolled in the *Vuzy* were receiving education in evening classes or by correspondence courses, the latter alone accounting for 1,772,000 students. However, full-time higher education has proved in practice to have some definite advantages, not only as far as quality is concerned, but also from an economic point of view. As a consequence, the planning authorities were invited by the government in 1966 to envisage the development of full-time education in preference to part-time education. Already in 1968, 51 per cent of the total student intake was in full-time departments, as against 49.2 per cent in 1967.

The reduction in the proportion of students receiving part-time education has been accompanied by changes in the structure of this type of education. In particular, the number of specializations open to part-time students was reduced by withdrawing training in physics, chemistry, astronomy, radio-physics and other subjects requiring a large amount of theoretical and laboratory work, from correspondence courses. Also, the number of part-time students in mathematics, mechanics and other disciplines difficult to reconcile with simultaneous gainful employment has been reduced. Lastly, in view of the importance of the relationship between the chosen field of specialization and the nature of the student's employment, new regulations have been laid down with regard to admissions. Since 1967, preference in admission to part-time education has been given to applicants whose production work corresponds closely to the chosen field of study.

In conclusion, it may be stated that, for the time being and for the foreseeable future, part-time training of specialists should be continued in most of the humanistic disciplines and, to a lesser extent, in the natural sciences. The problem of determining the optimum combination of the different forms of specialist training can only be solved through a comprehensive analysis of the different types of educational establishments and of the various specializations.

Hungary

27

Programming annual current and capital expenditures during the planning period

prepared by Lajos Faluvégi

This case study was prepared at the request of the IIEP by Lajos Faluvégi, Head of Budget Department, Ministry of Finance, Budapest.

I. The educational system

1. First-level education

Primary education in Hungary is compulsory: the proportion of the age group attending school, which was only 79 per cent in 1938, had reached 98 per cent in 1959.

Children enter primary school at the age of 6. The notional duration of primary schooling is eight years—the first four years in classes grouped by age, and the second four years grouped by the subjects studied. At the end of their primary education pupils sit for their elementary school certificate. Since in 1952 only 53 per cent of the 14-year age group were successful in this examination, and in 1958 only 67 per cent, the school leaving age was raised from 14 to 16 in 1961; the numbers of successful pupils have increased steadily since that date, and in 1968 80 per cent of the 14-16 age group obtained their certificate.

Tables 1, 2, 3 and 4 in Appendix I give detailed statistics on primary education.

2. Second-level education

Secondary education, lasting four years, leads to the baccalaureate examination in the final year: success in this examination is a necessary condition for taking the entrance examination for higher educational institutions. Four-year secondary education is provided in two types of schools:

(a) *General secondary schools*, giving general academic teaching in preparation for university courses (arts, natural sciences, law and medicine) and for teacher-training colleges for primary teachers (grades V to VIII).

(b) *Specialized secondary schools:* vocational schools (industrial, agricultural or economic), leading to secondary or 'middle-level' certificates, and technical schools, giving special training in similar fields. These latter are being phased out.

In addition, three-year secondary education is provided in a third type of school:

(c) *Skilled workers' training schools*, giving a more practical education in industrial, agricultural and commercial subjects, with a roughly fifty-fifty balance between theoretical and practical instruction. These schools do not give certificates which entitle the pupils to enter the higher educational entrance examinations, but successful pupils receive a certificate of vocational aptitude which entitles them to follow the final year's course in schools of type (a) and (b).

The total enrolment in secondary education in 1965 was 237,000 (compared with only 96,000 in 1950), of whom 36 per cent were in schools of type (a), 22 per cent in type (b), and 42 per cent in type (c). In that year 38 per cent of the number completing primary education enrolled in schools of types (a) and (b), and 48 per cent in type (c) schools.

Tables 5, 6, 7, 8 and 9 in Appendix I give detailed statistics on second-level education.

Furthermore, those children who finish their primary schooling at 14 and are not enrolled in one of the above second-level schools must attend a part-time continuation school for two years.

3. Higher education

There are three types of higher educational institutions:

(a) *Advanced technical and specialized schools:* three-year courses, mainly in industrial, agricultural and commercial subjects.

(b) *Teacher-training colleges:* four-year courses for primary and specialized primary-school teachers.

(c) *Universities:* four- to six-year courses, terminating in the award of a degree.

Entrance to all these establishments is by competitive examination after success in the baccalaureate.

Detailed statistics on higher education will be found in Tables 10, 11, 12, 13 and 14 in Appendix I.

4. Adult education

Adult education is available in Hungary in the form of evening classes and correspondence courses. Different motives, of course prompt adults to undertake further education—to acquire qualifications for job improvement or merely the desire to learn more.

5. Educational expenditure

The percentage the national income devoted to educational expenditure has substantially increased since 1950:[1]

	1950	1955	1960	1965	1967
Capital expenditure	0.5	0.2	0.5	0.5	0.7
Recurrent expenditure	2.5	2.8	3.4	4.3	4.2
Total expenditure	3.0	3.0	3.9	4.8	4.9

[1] Exchange rate 1969: 30.0 florins = US$ 1.

The percentage breakdown of educational expenditure among the various levels is shown below.

	Recurrent					Capital				
	1950	1955	1960	1965	1967	1950	1955	1960	1965	1967
Primary	38.8	39.9	44.6	39.2	38.7	24.0	37.2	66.7	33.1	20.0
Secondary	13.4	18.3	16.1	16.3	16.4	27.0	13.4	13.[illegible]	22.9	24.5
Skilled workers	6.6	11.5	11.5	11.3	11.9	11.7	12.4	5.1	5.8	12.5
Higher	18.1	18.6	13.4	15.5	16.4	37.3	37.0	15.0	38.2	43.0
Other	23.4	11.7	14.4	15.5	16.6	—	—	—	—	—
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

II. Educational planning

The progress made in education owes much to the planning that lies behind it; planning has enabled reasonable targets to be set and indicated the ways to meet them.

But educational planning cannot be treated in isolation, it must be seen within the context of over-all economic planning. The amount of money to be spent on education depends to a large extent on the total revenue available and also on the government's order of priorities. And when the appropriations for education have been decided upon they must be sub-allocated in the light of various policy considerations.

Firstly, there is long-term planning (15–20 years). The Planning office of the Ministry of finance draws up plans with the assistance of committees of experts in which the working group in education plays an important role. This group has prepared a study on the development of education during the last twenty years and is now engaged in the preparation of a long-term educational plan based on the analysis of past trends and the needs for qualified manpower arising out of the general economic plan.

Secondly, there is medium-term planning covering five-year periods. The Planning office arranges and co-ordinates a series of discussions by experts and takes into consideration suggestions made by competent bodies (other ministries, local government agencies and educational bodies). Then the appropriations for educational expenditure in terms of the long-term plan are set out and submitted to Parliament for approval by the Ministries of finance, labour and culture. Educational expenditure in the medium-term plan is divided into investment and operating expenditure. The major investment requirements are set out together with the estimated numbers of students for each level of education.

Thirdly, there are the annual plans, which are worked out on much the same basis as the medium-term plans. The aim of the annual plans is to ensure that the targets set out in medium-term plans are attained, or revised when conditions require it. The annual plans are, therefore, simply a breakdown of the medium-term plans providing the opportunity for partial reappraisal.

Naturally, there are aims which are unrealistic. If one decides to increase the numbers in the educational system then it is likely that one cannot have the improvements in the quality of education that one would wish for. However, some distributions of resources are better than others and a model can play an invaluable part in guiding planners. By using a computer, calculations that would take an enormous amount of time to do manually are done in seconds, so that the financial repercussions of different decisions can be rapidly appraised. One can calculate, for example, the effects of changes in numbers on costs per student, the effects of certain improvements on the per-student costs.

But to be able to develop and use a model a co-ordinated system of underlying concepts must be available. Thus before presenting the central feature, the model, the basic concepts must be set out.

First of all the two different types of development in education, quantitative and qualitative, must be examined. *Quantitative development* is basically the numerical increase in students, or, more precisely, the difference between the number of students to be taught in each type and level of education as forecast for the planned period and the enrolment figures for the year taken as the base. The quantitative increase or decrease in primary education is known from the population figures, but for secondary and higher education one has to take several factors into consideration. Some increase in the numbers in the educational system can be met by better use of existing facilities but beyond a certain point new institutions have to be built. These are obviously costly, and accurate figures are essential to avoid wastage of resources. Similarily with operating expenses; teachers are expensive and need to be used in the most economic way possible. Some costs are proportional to the numbers concerned and these are referred to as *fixed costs;* examples are teachers' salaries, social services, school meals and uniforms. Other expenditure does not vary directly with the numbers concerned—*variable costs*—maintenance costs, heating and lighting, for example.[1]

The *qualitative development* of education, improvement within the existing framework, nearly always entails making a choice between several desirable objectives. It is very important that qualitative factors should be clearly set out so that each can be separately considered. A qualitative development that has high priority in Hungary has been teachers' salaries.

In the Hungarian model the two basic concepts used are indicators and cost norms. *Indicators* express the number of students to receive education in the various types of educational institutions. In forecasting one needs to know the number of groups of students or the number of individuals, depending on the type of education concerned. In estimating costs one takes the average number for an academic year, i.e. the weighted average of the number at the beginning and end of the year.

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[1] It has been found that on average variable costs increase by 4 per cent of fixed costs.

Some students are undertaking full-time education, others evening classes, and others following correspondence courses, and obviously the cost varies for the different categories. The indicators take this into account by assuming that one student, that is one full-time student, is equivalent to three evening-class students or six correspondence students. The indicators are listed in full in Appendix II.

The *cost norms* express the estimated cost based on certain numbers (the indicators). They may represent the total cost or the partial cost of certain categories of expenditure per student or per group, for example the costs of teaching personnel, maintenance costs. The cost norms used in educational planning have been established from statistical data based on practical experience. A full list of the categories of expenditure used in establishing cost norms is given in Appendix II.

The above costs refer to educational costs which are covered by budgetary estimates. These are limited to the expenditure necessary for the running and equipping of purely educational institutions. Thus the costs of research institutes, university hospitals, libraries, museums, etc. are not included as they are not primarily educational.

Investment expenditure comes out of what is known as the accumulation fund, and current expenditure is financed out of the consumption fund.

III. The model

The effect of the quantitative development of education on current costs has been standardized algebraically and can be shown in a series of matrix operations as follows:

With respect to existing institutions:

$$F_1 = \hat{T}_1 \cdot A + \hat{T}_1' \cdot V + \hat{T}_1'' \cdot (V \cdot 0.4) \tag{1}$$

where

F_1 (s,t) = the cost estimate matrix of existing educational institutions, due to quantitative development (s = 1,2...s type of education, t = 1,2...t type of cost);

$\hat{T}_1$ (s,s) = diagonal matrix formed by the indicators of existing educational institutions for the plan year;

$\hat{T}_1$ = $\hat{T}_1' + \hat{T}_1''$ ($\hat{T}_1$ = number of students in the base period, T_1'' = changes in the number of students; the element a_{ij} of matrix T_1'' may be negative in case the number of students decreases);

A (s,t) = matrix of fixed cost norms per indicator (the element a_{ij} represents the fixed cost norm j in the type of education i);

V (s,t) = matrix of variable cost norms per indicator (the element v_{ij} represents the variable cost norm j in the type of education i).

Equation (1) therefore means that the amount of current expenditure necessary to cover operating costs consists of three elements: (i) the number of students to be enrolled in a given type of education multiplied by the constant cost norms relative to that type, (ii) the basic enrolment in a type of education multiplied by the corresponding variable cost norms, and (iii) the coefficients of change in the enrolment in the type of education and 40 per cent of the relative variable cost norms.

With respect to new institutions:

(2) $$F_2 = \hat{T}_2 \, (A' + V)$$

where

$\underset{(s,t)}{F_2}$ = matrix of current cost estimates of new educational institutions;

$\underset{(s,s)}{\hat{T}_2}$ = diagonal matrix formed by the indicators of the new educational institutions for the plan year.

Equation (2) shows that the sum of fixed and variable cost norms by types of costs multiplied by the number of students to be trained in the new institutions equals the current cost estimate for these institutions.

The combined current cost estimate $\underset{(s,1)}{f}$ of existing and new institutions by types of education will be:

(3) $$f = (F_1 + F_2) \, 1$$

The planned cost estimate due to the quantitative development of education securing an unchanged standard of education may be arrived at by the following addition:

(4) $$n_t = 1^* \cdot f$$

where n = the planned current cost estimate for education on the basis of quantitative development.

The effect of the *qualitative* development of education can be shown as follows:

Firstly, the material possibilities for improving the standard of education must be established. This is done in the following way:

(5) $$n_e - (n_t + a) = n_k$$

where

n_e = the part of the consumption fund of national income disposable for education;

n_t = the planned current-cost estimate of education, on the basis of quantitative development, but disregarding qualitative development;

a = the amount necessary for the replacement of fixed funds of educational institutions, taking into account amortization allowances;

n_k = the part of national income disposable for qualitative development of education.

In the next stage, amount n_k available for qualitative development must be allocated in proportion to the weighed requirements:

(6)
$$(\hat{T}_1 + \hat{T}_2)\, R = D$$
$$1^* \cdot D = d^*$$
$$d^* \cdot 1 = d$$

where

R (s,t) = the matrix of weighed qualitative development requirements by types of costs whose component — r_{ij} — expresses the required rise in cost norms by types of education, in money terms;

D (s,t) = the matrix of additional costs called forth by qualitative development, by types of costs and types of education, taking into consideration the indicators of the plan period;

d^* = the vector of additional costs required for the purpose of qualitative development, by types of costs;

d = the amount of additional costs required for the purpose of qualitative development in all types of education and for all types of costs.

It is assumed that the sum of the requirements is bigger than the possibilities, i.e. $d > n_k$. Only one step more is needed to achieve a proportionate allocation:

(7)
$$\frac{n_k}{d} = x$$
$$xD = N$$
$$1^* \cdot N \cdot 1 = n_k$$

where

N (s,t) = the matrix containing the proportionate allocation of the amount available for qualitative development, whose rows give information about the amounts to be used in the individual types of education, and the columns show the types of costs.

Mathematically, it can be proved unequivocally that there exists no distribution different from the result of (7) of the amount n_k, which would better approximate the weighed requirements in all of its elements (i.e. in respect of all types of costs in all types of education), provided that the following conditions are fulfilled:

(8)
$$1^* \cdot N \cdot 1 \leqslant n_k$$

This means that the amount allocated for the qualitative development of education cannot exceed the part of national income available for this purpose.

(9)
$$n_{k_{ij}} \leqslant d_{ij}$$

where

$n_{k_{ij}}$ = the amount that can be assured for the increase of unit cost type j in the education type i;

d_{ij} = the sum of the weighed requirements for the increase of unit cost type j in the education type i.

In other words: the amounts set aside for the increase of units costs of various types in the individual types of education should not exceed the weighed requirements relating to the same domain.

(10)
$$\lim_{n_k \to 1^* \cdot D \cdot 1} n_{k_{ij}} = d_{ij}$$

Equation (10) shows that, when the amount assured for qualitative development globally approximates the sum of the requirements, the amount assured for increasing cost type j in the type of education i should equally approximate to the weighted requirements in the same field.

(11)
$$\begin{aligned} 1^* \cdot G \cdot 1 &= n_g \\ n_k - n_g &= n_p \\ \frac{n_p}{1^* \cdot Z \cdot 1} \cdot Z &= Z' \\ G + Z' &= N' \\ 1^* \cdot N \cdot 1 &= 1^* \cdot N' \cdot 1 = n_k \end{aligned}$$

where

G = matrix of the elements g_{ij} intended to be established as deviating from the proportionate allocation. The components contain the new amounts determined on grounds of economic policy. Where the decision of economic policy does not deviate from the first allocation, $g_{ij} = 0$;

n_k = $n_g + n_p$;

n_g = the sum of the elements g_{ij};

n_p = national income disposable for qualitative development over and above the amount allocated to implementing the decisions (the elements g_{ij}) of economic policy;

Z = the matrix of components not yet affected by decisions of economic policy, worked out in the course of proportionate allocation by types of costs and types of education ($z_{ij} = n_{k_{ij}}$ where $g_{ij} = 0$, else $z_{ij} = 0$);

Z' = the modified allocation matrix of the elements not affected by the decisions of economic policy;

N' = matrix of the for-reasons-of-economic-policy modified distribution of the amount available for the qualitative development of education from national income, by types of costs and types of education.

After the performance of the computations indicated above, the *cost estimate* is obtained:

Fixed and variable costs:

— by types of education and types of costs (H):

(12)
$$H = F_1 + F_2 + N'$$

— aggregated by types of education (p):

(13)
$$p = H \cdot 1$$

— aggregated by types of costs (r^*):

(14) $$r^* = 1^* \cdot H$$

— all fixed and variable costs (h):

(15) $$\mathrm{h} = \mathrm{n}_t + \mathrm{n}_k$$

Total current expenditure: (n_e)

(16) $$\mathrm{n}_e = \mathrm{h} + \mathrm{a}$$

Global educational cost estimates combined: (E)

(17) $$\mathrm{E} = \mathrm{n}_e + \mathrm{b}_e$$

The current cost estimates and investment expenditure (b_e) together give the global educational cost estimates.

IV. The 1966-70 Plan

This section will be devoted to a comparison between forecasts and accomplishments of the plan as measured by the trend of the indicators, costs and educational expenditure. The figures are given in Tables 15, 16, 17, 18 and 19 in Appendix I. It should be noted that in these tables the planning estimates and the budget figures are at constant prices for both capital and recurrent expenditure.

Total allocations for the educational sector increased by 33 per cent during the period 1966–70. The share assigned to recurrent expenditure is about 80 per cent of the total for the plan period.

An analysis of the distribution of expenditure for primary, secondary and higher education respectively (recurrent expenditure, unit costs and welfare and social services) shows that the authorized programme allocations approved for the respective years did not differ significantly from the planned targets, the difference varying between 1 and 3 per cent.

The total expenditure increased in the period by about 2,000 million florins, the most rapid increase being in the total salary figures, representing an increased purchasing power on the part of the teachers (average salary) and larger numbers of auxiliary personnel. Expenditure for school services will reach 1.8 thousand million florins in 1970.

The above increases result from the effects of both quantitative and qualitative factors.

Quantitative factors

This upward trend of expenditure results from a number of sometimes contradictory factors, the most important of which is the changing total enrolment and age pattern of the pupils and students. In order to effect a logical distribution of the available funds, the planners must therefore carry out a thorough study of the *demographic factors.*

The total number of pupils and students shows a decrease of 13 per cent for the period, and the trend is very different in time according to the level and type of education. In primary education, which includes by far the greater part of the total enrolments, the decrease in the number of pupils amounts to 20 per cent in the period 1968–70, with the result that, while formerly there was a preponderance of the younger age groups, we now find a substantially larger proportion of the older age group—an increase from 12 per cent to 14 per cent in secondary education, from 9 per cent to 14 per cent in the skilled workers' training schools, and from 2.8 per cent to 3.3 per cent in the number of students in institutions of higher education.

To the effect of these changes in the age structure must be added the effects of the changes in the educational structure itself. For example, the development of secondary education brings with it a relative increase in social services and in boarding facilities (including organized means of transport, meals served at school etc.) which affect to a large extent educational expenditure.

Moreover, the trend in the enrolment figures affects the indicators differently according to the educational levels and even within a given level. For example, although the decrease in the number of pupils in primary education is general, it is not accompanied by a proportional decrease in the number of pupil groups. While the total enrolment was high, more than 33 pupils constituted an average group, whereas now this average is about 30. Also, the average enrolment by groups shows wide variations for different regions, as in villages and small townships the pupil groups are very small because pedagogical necessities make it necessary to make the regroupings for the different years of the courses as infrequent as possible. Under such conditions, it is normal that gaps should appear between forecasts and accomplishments. The reasons for these gaps can also be illustrated by other examples. Thus, in secondary education, the fulfilment of the enrolment estimates, in the form of indicators, depends on such uncertain factors as the number of pupils applying for admission to the different types of schools and the marks they obtain at the end of their primary schooling. The indicators will prove to be the more realistic the greater the success achieved in directing candidates who are not admissible in a given type of school to other types which may be more in tune with the needs of the national economy (e.g., the skilled workers' training schools). Since the development of the various types of educational institutions is effected at the municipal level (by the town councils or boards of education), it is difficult to estimate accurately the number of candidates at the national planning level. To that extent, the planning forecasts constitute a general indication for the development of the school system rather than a basis for imperative planning.

Qualitative changes

More than 85 per cent of the increase in unit costs results from qualitative improvements—50 per cent from the reform of the teachers' salary system with regular annual increases in salary and allowances, and 35 per cent from other factors of qualitative development—while the remaining 15 per cent corresponds to the increase necessary to offset the rise in prices in the period 1966–68.

Within the scope of the qualitative changes, the improvement of pedagogical conditions, the decrease of the average number per class (pupil groups), the increase in the number of lessons per week, in purchases of equipment and supplies, etc., also entail a considerable increase in costs. In order to avoid too heavy an increase in budgeted expenditure, other factors affecting the improvements must be taken into consideration to a limited extent. This principle is justified by the fact that the gradual increase in enrolments automatically results in an improvement of the pedagogical conditions (from the point of view of equipment and of personnel). The experience of the last few years shows that the amounts earmarked and used exceed the real increase of the indicators.

As has been demonstrated, qualitative changes affect average costs (unit costs). It must be recognized that these changes take place under the effect of factors which often act against one another. In a general way, indicators and unit costs vary in an inverse proportion. However, it is by no means certain that a variation of unit costs necessarily entails an improvement in the quality of the educational system. For example, an increase in the pupil/teacher ratio can be considered as an improvement, but it is by no means certain that an increase in the number of kilowatt hours of electricity consumed per pupil is also an improvement.

Unit costs

An examination of the data given in Table 18 shows that unit costs vary considerably according to the level and type of education. They may be as high as 136,000 florins in the specialized technical schools, owing particularly to the high cost of the practical courses. In the schools coming under the Ministry, the cost is often much higher than the average (180,000 florins in some technical and vocational schools), while in the schools coming under the municipal councils it is considerably below the average.

In the period 1966–70, the real unit costs showed quite different trends according to the level and type of education. Over the five-year period of the plan, the increase varies from 5 to 30 per cent. The fact that the rate of increase is highest at the university level is largely due to the fact that higher education is being oriented towards practical training, the effect of which is to increase not only equipment but also personnel costs, because practical instruction is given to smaller groups of students.

In a general way, these changes of a structural character have affected the trend of unit costs and of total costs at all educational levels. The conversion of the advanced technical secondary schools to the university level, the introduction of new programmes in the training of skilled workers, the creation of special courses in mathematics and biology in the secondary schools, and the relative reduction in the number of classrooms used by two different pupil groups in the primary schools are examples, among many others, of the changes which have considerably burdened unit costs.

Non-pedagogical factors, resulting from decisions of general economic policy, may also affect the trend of unit costs. That is the case with price variations and with the regular annual increase and periodic reforms of the salary structure. The mechanical effect of such increases on unit costs varies between different types of educational institutions; for example, salary costs vary from 67 to 71 per cent in primary education, from 31 to 33 per cent in primary boarding schools, from 50 to 59 per cent in secondary technical and vocational education, from 40 to 44 per cent in universities and other institutions of higher education, and from 18 to 25 per cent in the case of dormitories in secondary and higher education.

In this connection, the comparison between the planning estimates and the actual accomplishments is especially interesting. As shown in Table 18, the differences tended to be particularly high in 1966, especially in primary and secondary education. More precisely, the effect of the salary increases on total expenditure was felt most decidedly in primary education, where the unit cost increased by 12 per cent over what had been forecast in the plan for the year 1966. In secondary education, the difference was also quite significant, since it exceeded 6 per cent.

In 1967, the gap between targets and fulfilments was chiefly due to the fact that the amounts earmarked for the development of the indicators were utilized for other purposes in most types of education. The rate of fulfilment of the planned targets was unequal, varying between 96 and 103 per cent, closely following the indicator variations. Particularly high—15.5 per cent—was the excess of expenditure over estimates for dormitories and living accommodation as the result of an aid policy requiring very rapid improvement in that field. This involved the construction of more modern, and therefore more expensive, student homes and the liquidation of old and crowded quarters, and thus resulted in only a slight increase in the number of places available but a large increase in unit costs.

The management reform introduced in the preparation of the draft budgets in 1968 has made it possible to achieve substantially the targets of the school construction programme, while the indices of the programme only slightly exceeded the actual indices of the year 1968. Nevertheless, a rise in prices (especially imported items) which occurred during the year caused an increase in unit costs.

Our assumptions for the fulfilment of unit cost estimates for the years 1969 and 1970 are based on the trends observed during the preceding years, as there is nothing to indicate that any extraordinary circumstances will arise during the closing part of the current five-year plan period.

V. The need for further research

International bibliography shows that there have been important developments in methods of economic planning during the last few decades, especially in production and consumption planning, to the detriment of non-productive sectors, which have been neglected. In Hungary there are many problems of planning methodology for which no satisfactory solution has yet been found. In the field of educational planning, in particular, a need is felt for research on several basic problems.

We approach the problem of the *economic benefits of education* by working out the logical distribution of available resources with a view to meeting the manpower requirements. The planning of educational expenditure, therefore, poses a problem of *distribution* without any cost-benefit analyses being included in the plan. Moreover, the concept of differences in cost in the various types of education does not enter into the planning of the educational structure nor into the distribution of the budget funds. The whole thing is done as if the cost of education were the same in all categories.

One of the principal objectives of a planner is to establish methods for analysing the possibilities of reducing costs to a minimum. The method called *ex-ante* consists in examining the possibility of training the specialists required by the plan in the types of educational institutions where it can be done at the lowest cost. On the other hand, the *ex-post* method is used to analyse the surplus cost resulting from a training capacity exceeding the manpower requirements. These methods are proving very helpful in working out annual programmes and medium and long-term plans.

An essential duty incumbent upon planners consists in the *co-ordination of long-term plans, regional development and educational expansion.* Although regional differences are rapidly disappearing, education is not yet in a position to contribute to the acceleration of this process. The location and specialization of educational institutions are not always co-ordinated with the industrialization of the region. Requirements for specialists must therefore be met by transfer of personnel and are usually only met after harmful and costly delays. Even approximate calculations will serve to show the size and importance of such regional differences; to cite only one example, there is a 50 per cent difference between the *per capita* cultural expenditure (averaging 580 to 600 florins per budget year) of the most favoured and least favoured *comitats.* In order to diminish these differences, it is not sufficient to find optimal methods; it is necessary to solve much more complex problems of regional development and of preferences.

Actually, it is true that the persistence of regional differences can be justified by economic and demographic criteria. However, no answer has yet been found to such questions as determining the desirable economic and cultural level of the regions and the degree of difference which should be allowed between the regions. Research is now being conducted on these problems. For the period covered by the new Five-year Plan, we expect to establish projections of the targets to be attained by the end of the period for each *comitat* according to its level of development, and submit them to the Comitat Council. The distribution of fund allocations will be in accordance with the planned objectives.

A problem of major importance relates to the necessity of taking into consideration the possible consequences of *price and salary variations* in working out the annual budget programmes, and especially the medium-term plans. Owing to the uncertainties of the estimates made for the plan, a reserve fund has been set up, but there are still serious difficulties when the annual adjustments have to be made.

This problem is all the more serious because the economic reform has replaced fixed prices by free prices in a number of sectors of the economy and has inaugurated a more flexible policy with regard to salaries. We do not yet have enough experience to be able to evaluate price variations in advance and with precision. That is less a problem for profound scientific research than a problem of a practical nature requiring solutions in the field of statistics and accounting figures. A study by means of a sampling procedure relating to the requirements of educational institutions and a new salary system is in course of preparation. It should provide the necessary data to determine realistic educational costs.

Under the economic reform, the factories and enterprises have greater independence and enlarged resources, a part of which is to be utilized for social and cultural purposes. The increase of these funds in proportion to the total receipts will enable the factory managements to devote more attention and a greater financial effort to the effective and continuous occupational and professional training of their specialized workers, engineers and research specialists. An increase of *contacts and co-operation of factories and enterprises with the various educational and scientific research institutions* can already be observed in the form of scholarships, contributions of a material nature and joint investments. For education, that means additional resources, and as regards the national economy, the result may be a more judicious distribution of educational expenditure between the State and the enterprises. It will, therefore, be appropriate to take into account not only the budget possibilities, but also the financial capabilities of the factories and enterprises in planning the financing of educational expenditure. The experience acquired during the first year of the reform gives hope that this new factor will contribute greatly in widening the sources of finances for the educational system.

Appendix I

TABLE A.1. Primary schools: enrolments and number of pupils in final year; drop-outs during the 8-year cycle

First year of cycle	Final year of cycle	Number of pupils in first year	Pupils qualifying at the end of the eighth year		Drop-outs during the 8-year cycle	
			Number	Percentage[1]	Number	Percentage[1]
1951–52	1958–59	168 865	106 680	63.2	62 185	36.8
1952–53	1959–60	159 568	107 349	67.3	52 219	32.7
1953–54	1960–61	181 123	127 178	70.2	53 945	29.8
1954–55	1961–62	192 943	140 422	72.8	52 521	27.2
1955–56	1962–63	196 000	148 384	75.7	47 616	24.3
1956–57	1963–64	205 004	154 495	75.4	50 509	24.6
1957–58	1964–65	206 801	157 797	76.3	49 004	23.7
1958–59	1965–66	198 142	152 349	76.9	45 793	23.1
1959–60	1966–67	210 543	162 934	77.4	47 609	22.6
1960–61	1967–68	229 151	181 542	79.2	47 609	20.8

1. In relation to enrolments.

TABLE A.2. Primary schools: enrolment ratios of various age-groups

School year	Enrolment ratio of children aged 6-13 (for the 8-year cycle)		Enrolment ratio in first year of compulsory schooling (age 6)	
	Number	Percentage	Number	Percentage
1959–60	1 309 398	98.3	181 582	98.6
1960–61	1 379 282	98.5	201 096	99.2
1961–62	1 422 684	98.8	197 211	98.3
1962–63	1 440 314	98.8	179 836	98.1
1963–64	1 432 924	98.8	159 594	98.3
1964–65	1 408 812	98.8	147 908	97.1
1965–66	1 381 114	98.8	142 704	96.9
1966–67	1 354 142	98.7	136 909	97.2
1967–68	1 305 910	98.8	130 806	97.4
1968–69	1 229 682	98.7	122 707	96.8

TABLE A.3. Primary schools: number of pupils

Year	Number of pupils		
	Years 1-4	Years 5-8	Total
1958–59	726 729	541 921	1 268 650
1959–60	743 922	570 510	1 314 432
1960–61	775 663	616 597	1 392 260
1961–62	796 856	647 687	1 444 543
1962–63	805 764	666 979	1 472 743
1963–64	784 018	684 665	1 468 683
1964–65	730 477	714 647	1 445 124
1965–66	675 352	738 160	1 413 512
1966–67	630 756	749 530	1 380 286
1967–68	595 947	735 132	1 331 079
1968–69	567 222	687 523	1 254 745

TABLE A.4. Primary schools: number of teachers by qualifications

Year	Total teaching staff	Of which			Percentage		
		With		With no teacher training	Certificated teachers	Certificated instructors	Teaching staff without training
		Teacher's certificate	Instructor's certificate				
1958/59	55 056	22 348	32 306	402	40.6	58.7	0.7
1959/60	56 449	22 896	32 893	660	40.5	58.3	1.2
1960/61	57 290	22 412	33 289	1 589	39.1	58.1	2.8
1961/62	58 333	22 544	32 926	2 863	38.6	56.5	4.9
1962/63	59 921	23 108	32 590	4 223	38.6	54.4	7.0
1963/64	61 518	23 734	31 940	5 844	38.6	51.9	9.5
1964/65	62 108	24 850	31 232	6 026	40.0	50.3	9.7
1965/66	62 167	25 714	30 785	5 668	41.4	49.5	9.1
1966/67	62 241	26 538	31 107	4 596	42.6	50.0	7.4
1967/68	62 340	28 911	29 972	3 457	46.4	48.1	5.5
1968/69	62 523	30 341	29 381	2 801	48.5	47.0	4.5

TABLE A.5. Secondary education: drop-outs during the 4-year cycle; numbers and percentages of enrolments and completions

First year of cycle	4th year of cycle	Total enrolment		Number of graduates (baccalaureat)[1]		Drop-outs during the 4-year cycle					
						General secondary schools		Technical schools and colleges		Total	
		General secondary schools	Technical schools and colleges	General secondary schools	Technical schools and colleges	Number	Percentage	Number	Percentage	Number	Percentage
1948–49	1951–52	11 387	8 240	7 190	7 352	4 197	36.9	888	10.8	5 085	25.9
1949–50	1952–53	17 780	13 655	10 784	8 887	6 996	39.3	4 768	34.9	11 764	37.4
1950–51	1953–54	17 052	18 843	10 558	10 100	6 494	38.1	8 743	46.4	15 237	42.4
1951–52	1954–55	15 298	21 578	9 431	12 354	5 867	38.4	9 224	42.7	15 091	40.9
1952–53	1955–56	17 572	22 439	11 429	11 736	6 143	34.9	10 703	47.7	16 846	42.1
1953–54	1956–57	21 394	23 379	13 259	10 620	8 135	38.0	12 759	54.6	20 894	46.7
1954–55	1957–58	21 867	14 504	14 405	9 478	7 462	34.1	5 026	34.7	12 488	34.3
1955–56	1958–59	23 867	10 489	15 143	8 281	8 724	36.6	2 208	21.1	10 932	31.8
1956–57	1959–60	27 405	12 304	17 121	8 225	10 284	37.5	4 079	33.2	14 363	36.2
1957–58	1960–61	29 611	12 053	20 305	8 477	9 306	47.5	3 576	29.7	12 882	30.9
1958–59	1961–62	33 164	12 674	23 473	9 506	9 691	29.2	3 168	25.0	12 859	28.1
1959–60	1962–63	31 569	13 051	22 738	10 432	8 831	27.9	2 619	20.1	11 450	24.5
1960–61	1963–64	32 068	13 736	22 805	12 601	9 263	28.3	2 135	14.5	11 398	24.4
1961–62	1964–65	38 290	16 845	27 651	13 334	10 639	27.8	3 511	20.8	14 150	25.7
1962–63	1965–66	42 512	19 428	29 115	14 806	13 397	31.5	4 622	23.8	18 019	29.1
1963–64	1966–67	45 811	23 129	29 445	17 429	16 366	35.7	5 700	24.6	22 066	32.0
1964–65	1967–68	44 302	27 034	28 660	19 625	15 642	35.3	7 409	27.4	23 051	32.3
1965–66	1968–69	39 677	26 779								
1966–67	1969–70	34 113	26 193								
1967–68	1970–71	35 337	28 746								

1. Not counting repeaters.

TABLE A.6. Secondary education: enrolment rate in first year in relation to numbers completing primary education

School year	Number completing 8-year cycle of primary school	School year	Number of enrolments in first year of secondary school	Percentage of enrolments in relation to primary school leavers
1957–58	115 892	1958–59	45 838	39.6
1958–59	106 680	1959–60	44 620	41.8
1959–60	107 349	1960–61	46 804	43.6
1960–61	127 178	1961–62	55 135	43.4
1961–62	140 422	1962–63	61 940	44.1
1962–63	148 384	1963–64	68 940	46.5
1963–64	154 495	1964–65	71 336	46.2
1964–65	157 797	1965–66	66 456	42.1
1965–66	152 349	1966–67	60 306	39.6
1966–67	162 934	1967–68	64 119	39.4
1967–68	181 542	1968–69	68 915	38.0

TABLE A.7. Secondary education: qualifications of teaching staff

School year	Total teaching staff	Certificated secondary school teachers	Certificated primary school teachers	Certificated technical school teachers	Certificated instructors	Uncertificated trained teachers	Teachers with no training
1958/59	8 402	7 251	272	—	115	70	694
1959/60	8 360	7 181	267	—	94	75	743
1960/61	8 778	7 430	335	—	102	66	845
1961/62	9 232	7 351	319	—	492	81	989
1962/63	9 619	7 937	392	—	99	75	1 116
1963/64	10 631	8 343	573	118	137	64	1 396
1964/65	11 561	8 844	802	127	151	99	1 538
1965/66	12 049	9 204	897	139	144	101	1 564
1966/67	12 317	9 420	864	200	149	95	1 589
1967/68	12 583	9 923	644	183	98	83	1 652
1968/69	12 948	10 145	687	257	109	124	1 626

Table A.8. Secondary education: numbers of pupils

							Technical schools				
							Economic				
School year	Public secondary schools	Private secondary schools	Art colleges	Specialised (technical) colleges	Teacher training (primary)	Teacher training (pre-primary)	Under the Ministry of culture	Others	Industrial	Agricultural	Total
1937–38	30 593		—	—	8 336	450	12 164			806	52 349
1946–47	29 557		—	—	11 867	499	17 644	—	3 804	2 729	66 100
1947–48	34 541		—	—	12 153	447	16 758	—	5 624	3 048	72 571
1948–49	36 758		—	—	9 132	797	15 182	—	6 616	3 295	71 780
1949–50	44 150		—	—	10 263		15 365	—	7 804	4 482	82 064
1950–51	44 936	4 318	713	—	9 314	1 636	16 555	—	13 058	5 235	95 765
1951–52	47 254	4 826	783	—	9 263	2 303	17 684	—	18 942	6 834	107 889
1952–53	53 321	2 661	1 050	—	10 137	2 946	18 254		23 778	7 285	119 432
1953–54	57 283	2 807	1 446	—	10 350	3 651	10 391	8 213	27 063	8 565	129 769
1954–55	60 846	2 745	867	—	7 463	2 535	9 582	6 823	23 855	7 911	122 627
1955–56	67 727	2 856	1 156	—	5 494	1 557	8 893	5 530	19 828	6 065	119 106
1956–57	77 398	2 805	1 189	—	4 112	876	8 616	5 223	19 933	5 349	125 501
1957–58	82 772	2 598	1 184	—	2 000	534	8 396	5 354	18 624	5 051	126 513
1958–59	92 628	2 703	1 299	—	1 949	312	8 801	5 806	18 995	4 664	137 157
1959–60	99 349	2 678	1 414	—	788	—	9 400	6 306	20 427	5 136	145 498
1960–61	105 598	2 660	1 432	—	—	—	11 004	6 726	21 860	6 247	155 527
1961–62	114 080	2 729	1 443	2 960	—	—	12 224	7 214	23 634	6 919	170 933
1962–63	123 661	2 727	1 416	7 149	—	—	12 578	7 521	24 938	7 464	187 454
1963–64	137 019	2 744	1 406	16 024	—	—	12 001	7 792	26 096	7 601	210 683
1964–65	147 034	2 855	1 387	29 124	—	—	9 533	7 810	26 476	7 089	231 308
1965–66	144 022	2 878	1 325	41 220	—	—	6 093	7 368	26 335	7 348	236 589
1966–67	133 316	2 838	1 357	49 873	—	—	3 107	6 932	25 685	7 191	230 299
1967–68	126 331	2 779	1 483	59 114	—	—	868	4 824	25 066	7 194	227 659
1968–69	122 828	2 788	1 685	69 345	—	—	—	3 005	23 347	5 231	228 229

TABLE A.9. Training of specialized workers

School year	Number of pupils	Percentage of pupils in relation to total population aged 14-16	Number of teachers of theoretical subjects	Number of teachers of technical subjects
1958–59	101 561	22.2	1 250	2 539
1959–60	116 566	25.5	1 470	2 864
1960–61	125 343	28.3	1 582	3 472
1961–62	134 782	30.6	1 647	3 682
1962–63	143 957	31.4	1 788	3 966
1963–64	151 154	30.7	2 006	5 100[1]
1964–65	163 892	32.1	2 248	5 642[1]
1965–66	172 383	33.2	2 446	4 713
1966–67	183 599	35.5	2 442	4 404
1967–68	194 591	36.7	2 691	4 986
1968–69	212 264	37.0	2 827	3 924

1. Including specialized workers in charge of practical courses.

Table A.10. Higher education: number of graduates in relation to enrolments in first year (duration of studies ranges from two to six years according to type of establishment)

School year	Students in final year of study	Original enrolment in first year	Drop-outs	
			Number	Percentage
1958–59	4 442	6 465	2 023	31.3
1959–60	4 112	5 850	1 738	29.7
1960–61	4 350	6 048	1 698	28.1
1961–62	5 223	6 307	1 084	17.2
1962–63	7 119	8 459	1 340	15.8
1963–64	8 435	9 987	1 552	15.5
1964–65	9 538	11 142	1 604	14.4
1965–66	10 669	12 585	1 916	15.2
1966–67	11 887	14 120	2 233	15.8
1967–68	11 859	14 286	2 427	17.0
1968–69	11 059	13 225	2 166	16.4

Table A.11. Higher education: percentage of enrolments in relation to completions of secondary education

Number of pupils with diploma (or certificate of professional aptitude) in secondary schools		Enrolment in first year at higher educational establishments		
School year	Number of pupils	School year	Number of students	Percentage
1957–58	25 839	1958–59	6 051	23.4
1958–59	26 209	1959–60	7 890	30.1
1959–60	26 673	1960–61	8 369	31.4
1960–61	30 898	1961–62	10 554	34.2
1961–62	35 745	1962–63	12 431	34.8
1962–63	36 044	1963–64	13 707	38.0
1963–64	38 218	1964–65	14 112	36.9
1964–65	44 769	1965–66	14 154	31.6
1965–66	48 677	1966–67	14 389	29.6
1966–67	51 874	1967–68	14 406	27.8
1967–68	53 384	1968–69	14 199	26.6

Table A.12. Higher education: number of day students, by type of establishment

School year	Universities (with faculties of letters, science and law)	Polytechnic universities	Agricultural universities	Medical universities	Total	High schools		
						Teacher-training (primary)	Arts (Music, Fine arts, etc.)	Agriculture
1958–59	4 880	6 222	1 371	6 308	18 781	1 713	787	2 148
1959–60	5 601	6 534	1 266	6 446	19 847	1 968	826	2 211
1960–61	6 855	7 292	1 257	6 609	22 013	2 124	822	2 463
1961–62	8 081	8 271	1 419	6 925	24 696	2 337	841	2 724
1962–63	9 368	9 471	2 590	7 064	28 493	3 076	851	1 789
1963–64	10 681	10 414	2 661	7 292	31 048	3 538	863	1 937
1964–65	11 210	10 853	2 635	7 564	32 262	4 055	859	2 050
1965–66	11 659	11 032	2 720	7 685	33 096	4 280	823	2 096
1966–67	11 831	10 890	2 676	7 769	33 166	4 208	1 103	2 100
1967–68	11 460	10 520	2 587	7 722	32 289	4 091	1 253	2 009
1968–69	10 816	10 395	3 352	7 626	32 189	4 160	1 207	1 243

Table A.13. Higher education: number of students by course of study

School year	Technical[1]			Agricultural		Economic		Studies		
										In profess.
	Total	In high schools	In higher technical schools	Total	In higher secondary schools	Total	In specialised schools	Arts	Science	Total
1950–51	7 134	—	—	1 834	—	1 995	—	2 668	2 507	2 167
1951–52	9 631	—	—	2 382	—	2 657	—	2 853	3 187	2 949
1952–53	12 421	—	—	2 292	—	2 992	—	3 195	3 830	3 612
1953–54	12 861	—	—	2 648	—	2 867	—	3 301	4 139	3 499
1954–55	11 060	—	—	3 273	—	2 038	—	2 760	3 378	1 984
1955–56	11 393	—	—	3 185	—	1 637	—	2 274	2 369	822
1956–57	10 299	—	—	3 240	—	1 111	—	1 803	1 850	1 270
1957–58	7 616	—	—	2 452	—	936	—	1 393	1 417	1 343
1958–59	6 929	—	—	2 152	—	917	—	1 462	1 536	1 486
1959–60	7 324	—	—	2 063	—	1 010	—	1 672	1 912	1 718
1960–61	8 208	—	—	2 178	—	1 115	—	2 137	2 544	1 852
1961–62	9 675	—	377	3 399	948	1 329	—	2 420	3 016	1 993
1962–63	11 656	—	1 068	4 484	1 881	1 861	235	2 850	3 565	2 723
1963–64	13 787	—	2 183	5 016	2 265	2 416	464	3 246	4 078	3 158
1964–65	15 728	—	3 636	5 296	2 460	2 613	581	3 549	4 388	3 667
1965–66	17 187	—	4 891	5 306	2 374	2 920	786	3 715	4 491	3 890
1966–67	18 096	—	5 933	5 166	2 247	3 114	963	3 748	4 547	3 831
1967–68	18 757	—	6 970	4 778	1 987	3 265	1 177	3 451	4 490	3 737
1968–69	19 120	124	7 384	4 501	1 639	3 489	1 357	3 099	4 140	3 832

[1] Including agro-mechanical studies at the University of Agriculture, the University of the Wood Industry, and the higher technical schools.

					Higher technical schools				
Polytechnics	Total	Teacher-training	Teacher-training (kindergarten)	Total	Polytechnics	Agriculture	Economics	Total	Total enrolment in higher education
—	4 648	—	—	—	—	—	—	—	23 429
—	5 005	688	273	961	—	—	—	—	25 813
—	5 409	1 398	524	1 922	—	—	—	—	29 344
—	5 902	2 060	543	2 603	195	1 130	—	1 325	34 526
—	5 716	2 281	579	2 860	835	2 114	235	3 184	40 253
—	6 338	2 363	575	2 938	1 839	2 609	464	4 912	45 236
—	6 964	2 339	568	2 907	3 069	3 027	581	6 677	48 810
—	7 199	2 101	555	2 656	4 291	2 974	786	8 051	51 002
—	7 411	2 018	589	2 607	5 321	2 859	963	9 143	52 327
—	7 353	1 973	658	2 631	6 365	2 592	1 177	10 134	52 407
124	6 734	2 088	670	2 758	6 750	2 273	1 357	10 380	52 061

Studies										
high schools										
Re-training	Teacher training	Teacher training (pre-primary)	Medecine	Pharmacy	Veterinary	Law	Arts (various)	Physical culture	Others	Total
148	—	—	3 838	624	612	1 332	1 495	302	—	26 508
154	—	—	3 590	637	675	1 116	1 590	332	253	31 852
151	—	—	3 453	603	735	1 102	1 257	373	536	36 401
140	—	—	4 246	703	762	1 188	1 155	399	615	38 283
134	—	—	4 464	878	903	1 146	1 045	382	306	33 617
137	—	—	4 816	962	806	1 077	974	350	—	30 665
186	—	—	5 207	1 013	783	1 024	966	319	—	28 885
174	—	—	5 260	953	684	940	768	251	—	24 013
170	—	—	5 450	858	660	965	787	227	—	23 429
185	688	273	5 589	857	624	1 007	826	250	—	25 813
214	1 398	524	5 744	865	626	1 059	822	272	—	29 344
237	2 060	543	6 037	888	665	1 316	841	344	—	34 526
259	2 281	579	6 182	882	659	1 327	851	353	—	40 253
285	2 363	575	6 381	911	657	1 405	863	380	—	45 236
274	2 339	568	6 652	912	610	1 241	859	388	—	48 810
259	2 101	555	6 776	909	620	1 319	823	390	—	51 002
245	2 018	589	6 904	865	584	1 385	1 103	377	—	52 327
225	1 973	658	6 870	852	538	1 431	1 253	354	—	52 407
223	2 088	670	6 780	846	516	1 445	1 207	328	—	52 061

TABLE A. 14. Higher education: numbers and grades of teaching staff

School year	Profes-sors [1]	Readers [1]	Seminar Lectu-rers [1]	Lectu-rers [1]	Assistants	P.E. In-structors	Teachers in university institutes	Technical teachers	Total	Lecturers	Assistant Lecturers [2]
1953/54	672	533	1 013	3 191	205	63	—	—	5 677	—	—
1954/55	647	539	1 054	2 557	173	66	—	—	5 036	—	—
1955/56	622	579	1 086	2 370	190	20	—	—	4 867	—	—
1956/57	632	574	1 111	2 185	190	61	—	—	4 753	689	329
1957/58	600	558	1 193	2 358	197	60	—	—	4 966	—	—
1958/59	588	545	1 250	2 281	187	57	—	—	4 908	—	—
1959/60	575	584	1 375	2 246	201	54	—	—	5 035	614	426
1960/61	581	620	1 521	2 295	207	52	359	—	5 635	788	335
1961/62	587	625	1 689	2 082	209	56	395	222	5 865	865	220
1962/63	598	713	1 928	2 364	222	67	410	400	6 702	1 008	425
1963/64	827	984	2 198	2 553	245	86	385	—	7 278	1 599	440
1964/65	931	1 152	2 460	2 660	268	82	385	—	7 938	1 813	417
1965/66	991	1 220	2 581	2 881	276	97	398	—	8 444	1 756	331
1966/67	1 060	1 334	2 793	2 825	284	96	339	158	8 889	1 759	324
1967/68	1 108	1 436	2 734	2 797	308	104	340	169	8 996	1 978	273
1968/69	1 167	1 530	2 856	2 748	293	108	340	188	9 230	2 303	293

1. Hierarchical grades of the university.
2. Not yet certificated

TABLE A.15. Capital expenditure and running expenses at current prices (in millions of florins)[1]

Level of education	1966			1967			1968			1969			1970		
	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Estimated	Percentage	Planned	Estimated	Percentage
Primary	3 102.0	3 314.7	106.9	3 452.6	3 412.6	98.8	3 516.8	3 506.2	99.7	3 735.3	3 694.2	98.9	3 931.2	3 887.6	98.9
Secondary	1 553.9	1 579.7	101.7	1 689.2	1 632.7	96.7	1 747.9	1 717.6	98.3	1 876.6	1 828.4	97.4	1 933.6	1 884.6	97.5
Higher	1 906.0	1 892.7	99.3	1 980.6	1 942.8	98.1	2 155.1	2 175.1	100.9	2 352.6	2 290.0	97.3	2 417.5	2 364.2	97.8
Training of specialized workers	1 168.1	1 126.9	96.5	1 274.0	1 182.5	92.8	1 330.0	1 265.0	95.1	1 367.7	1 339.5	97.9	1 464.5	1 427.9	97.5
TOTAL	7 730.0	7 914.0	102.4	8 396.4	8 170.6	97.3	8 749.8	8 663.9	99.0	9 332.2	9 152.1	98.1	9 746.8	9 564.3	98.1

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[1] Excluding expenditure of institutions.

Table A.16. Current expenses of educational establishments (in millions of florins)

Level of education	1966			1967			1968			1969			1970		
	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Estimated	Percentage	Planned	Estimated	Percentage
I. *Running expenses*															
Primary: of which	2 772.8	2 993.2	107.9	3 117.9	3 078.6	98.7	3 080.8	3 082.2	100.1	3 233.6	3 204.5	99.1	3 396.1	3 365.5	99.1
Primary schools	1 951.1	2 166.6	111.0	2 170.2	2 201.7	101.5	2 150.0	2 191.3	101.9	2 228.8	2 232.9	100.2	2 309.9	2 306.2	99.8
Nursery classes	577.8	610.6	105.7	669.2	646.5	96.6	689.4	658.6	95.5	739.1	734.1	99.3	794.3	786.6	99.0
Secondary: of which	1 170.3	1 226.1	104.8	1 313.9	1 266.6	96.4	1 284.5	1 272.2	99.0	1 376.9	1 346.7	97.8	1 415.4	1 384.4	97.8
General secondary	367.4	384.9	104.8	378.4	377.0	99.6	368.5	376.0	102.0	386.4	380.5	98.5	384.4	375.0	97.6
Specialized secondary	321.8	337.2	104.8	357.8	350.0	97.8	368.8	372.0	100.9	415.2	406.6	97.9	438.4	430.0	98.1
Boarding facilities	278.5	292.4	105.0	305.8	307.0	100.4	323.2	325.1	100.6	351.2	336.4	95.8	369.2	354.0	95.9
Higher: of which	1 224.1	1 241.9	101.5	1 292.4	1 285.3	99.5	1 336.0	1 391.0	104.1	1 491.4	1 463.8	98.1	1 536.2	1 516.9	98.7
Universities	777.7	783.8	100.8	825.3	804.2	97.4	829.7	880.9	106.2	914.7	903.4	98.8	919.7	917.0	99.7
Miscellaneous	303.5	307.9	101.4	315.9	319.8	101.2	344.0	342.9	99.7	382.5	370.9	97.0	413.9	400.2	96.7
Residential facilities	98.9	105.5	106.7	104.7	114.7	109.6	114.6	119.9	104.6	139.2	135.2	97.1	145.8	143.7	98.6
Specialized workers	901.0	877.3	97.4	1 004.2	924.4	92.1	1 017.4	965.5	94.9	1 040.8	1 026.6	98.6	1 130.3	1 107.7	98.0
TOTAL	6 068.2	6 338.5	104.5	6 728.4	6 554.9	97.4	6 718.7	6 710.9	99.9	7 142.7	7 041.6	98.6	7 478.0	7 374.5	98.6
II. *Expenses for replacement of equipment*															
Total	337.8	316.5	93.7	344.0	356.7	103.7	473.1	473.1	100.0	630.5	630.5	100.0	710.8	710.8	100.0
GRAND TOTAL	6 406.0	6 655.0	103.9	7 072.4	6 911.6	97.7	7 191.8	7 184.0	99.9	7 773.2	7 672.1	98.7	8 188.8	8 085.3	98.7

TABLE A.17. Average changes of indicators

Relating to	1966			1967			1968			1969			1970		
	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Estimated	Percentage	Planned	Estimated	Percentage
Primary															
Pupil groups in primary schools	44 284	43 740	98.8	43 711	43 175	98.8	42 993	42 692	99.3	42 631	42 249	99.1	41 871	41 694	99.6
Pupil groups in nursery classes	5 063	5 056	99.9	5 400	5 360	99.3	5 712	5 627	98.5	5 982	5 917	98.9	6 261	6 261	100.0
Secondary															
Classes in general secondary schools	4 260	4 215	98.9	4 048	4 052	100.1	3 902	3 892	99.7	3 791	3 790	100.0	3 736	3 696	98.9
Classes in specialized secondary schools	2 646	2 600	98.3	2 796	2 774	99.2	2 882	2 900	100.6	3 015	3 009	99.8	3 160	3 148	99.6
Boarding places	37 132	36 785	99.1	38 227	38 098	99.7	39 582	38 754	97.9	40 299	39 758	98.7	41 141	40 833	99.3
Higher															
Number of university students	39 455	39 546	100.2	38 223	37 609	98.4	36 651	36 143	98.6	35 860	35 500	99.0	35 794	35 600	99.5
Number of other higher education students	19 797	20 090	101.5	19 618	20 722	105.6	20 649	21 272	103.0	22 273	22 600	101.5	24 014	23 990	99.9
Residential places	25 037	24 096	96.2	26 004	24 660	94.8	27 303	25 332	92.8	29 424	28 200	95.8	30 649	29 500	96.3
Training of specialized workers															
Number of students	179 000	176 121	98.4	192 000	187 263	97.5	205 000	200 500	97.8	216 100	213 000	98.6	224 333	221 000	98.5

TABLE A.18. Unit costs of educational institutions (in florins)

Relating to	1966			1967			1968			1969			1970		
	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned	Estimated	Percentage	Planned	Estimated	Percentage
Primary															
Pupil groups in primary schools	44 059	49 533	112.4	49 649	50 995	102.7	50 008	51 328	102.6	52 281	52 851	101.1	55 167	55 313	100.3
Pupil groups in nursery classes in primary schools	114 122	120 767	105.8	123 926	120 616	97.3	120 693	117 043	97.0	123 554	124 066	100.4	126 865	125 635	99.0
Secondary															
Classes in general secondary schools	86 244	91 316	105.9	93 478	93 040	99.5	94 439	96 608	102.3	101 925	100 396	98.5	102 890	101 461	98.6
Classes in specialized secondary schools	121 617	129 692	106.6	127 968	126 171	98.6	127 967	128 276	100.2	136 650	135 128	98.9	138 734	136 594	98.5
Boarding places	7 500	7 949	106.0	8 000	8 058	100.7	8 165	8 388	102.7	8 715	8 461	97.1	8 974	8 669	96.6
Higher															
Number of university students	19 711	19 820	100.6	21 592	21 383	99.0	22 638	24 373	107.7	25 507	25 448	99.8	25 694	25 758	100.2
Number of other higher education students	15 330	15 326	99.9	16 102	15 433	95.8	16 659	16 120	96.8	17 123	16 412	95.6	17 236	16 682	96.8
Residential places	3 950	4 378	110.8	4 027	4 651	115.5	4 197	4 733	112.7	4 730	4 794	101.4	4 757	4 870	102.

TABLE A.19. (i) Number of personnel (teachers and others) 1966-70
(ii) Estimated breakdown of salary expenses, 1970 (in millions of florins)

Level of education	1966			1967			1968			1969			1970	Estimated salary expenses (in million florins)
	Planned	Actual	Percentage	Planned	Actual	Percentage	Planned (Total of decentralized plans)	Actual	Percentage	Planned (Total of decentralized plans)	Estimated	Percentage	Planned	
Primary: of which	78 359	77 820	99.3	79 065	78 560	99.4	79 977	79 467	99.4	81 724	81 380	99.6	83 299	1 896.7
Primary schools	63 305	62 880	99.3	63 401	63 983	100.9	63 718	63 510	99.7	64 591	64 450	99.8	65 000	1 554.4
Nursery schools	10 270	10 195	99.3	10 749	10 685	99.4	1. 429	11 302	98.9	12 011	11 880	98.9	12 800	225.3
Secondary: of which	23 588	23 319	98.9	24 057	23 849	99.1	24 322	23 031	94.7	24 382	23 407	96.0	24 876	621.0
General secondary	9 798	9 690	98.9	9 310	9 220	99.0	9 000	8 775	97.5	8 719	8 458	97.0	8 593	236.1
Specialized secondary	7 409	7 328	98.9	8 108	8 027	99.0	8 358	7 460	89.3	8 450	8 027	95.0	8 848	215.8
Boarding facilities	4 870	4 816	98.9	5 028	4 978	99.0	5 078	4 937	97.2	5 207	5 051	97.0	5 266	87.4
Higher: of which	19 300	18 900	97.9	19 700	19 200	97.5	20 775	20 365	98.0	21 997	21 600	98.2	22 527	540.6
Universities	12 960	12 600	97.2	13 190	12 700	96.3	13 592	13 577	99.9	14 501	14 200	97.9	14 800	373.4
Miscellaneous	4 700	4 660	99.1	4 800	4 750	99.0	5 037	4 858	96.4	5 326	5 270	98.9	5 450	134.9
Residential facilities	1 600	1 540	96.3	1 700	1 650	97.1	2 024	1 818	89.8	2 014	1 970	97.8	2 100	29.5
Training of specialized workers	11 723	11 308	96.5	12 441	12 017	96.6	13 337	12 817	96.1	13 592	13 300	97.9	14 148	338.0
TOTAL	132 970	131 347	98.8	135 263	133 626	98.8	138 411	135 680	98.0	141 695	139 687	98.6	144 850	3 396.3

Appendix II

The indicators used in the model are:

(a) Kindergartens, full-time or part-time nursery service (number of places available)
(b) Primary schools (number of pupil groups)
(c) Dayrooms or care and supervision sections of primary schools (number of pupil groups)
(d) Boarding schools for primary pupils (number of places)
(e) Other kinds of primary education (number of pupils)
(f) Children's homes providing schooling and institutions for child protection (number of places available)
(g) Training schools for skilled workers (number of students)
(h) High schools (number of classes)
(i) Vocational and technical secondary schools (number of classes)
(j) Secondary-level boarding schools (number of places)
(k) Universities and other institutions of higher education (number of students)
(l) Higher technical schools (number of students)
(m) Adult education and other courses (number of participants)

The cost norms used in the model are:

(a) Salaries of personnel
(b) Fees of various kinds (payments to persons not regularily employed, such as lecturers, members of examining boards)
(c) Special benefits (such as scholarships)
(d) Meals
(e) Clothing supplied
(f) Procurement of fixed assets and small constructions
(g) Other expenditure to cover costs of personnel
(h) Maintenance of property and fixtures
(i) Heating and electricity costs
(j) Other operating expenses (such as transportation and medicine).

IIEP book list

The following books, published by Unesco:IIEP, are obtainable from the Institute or from Unesco and its national distributors throughout the world:

Educational development in Africa (1969. Three volumes, containing eleven African research monographs)

Educational planning: a bibliography (1964)

Educational planning: a directory of training and research institutions (1968)

Educational planning in the USSR (1968)

Fundamentals of educational planning (series of monographs: full list available on request)

Manpower aspects of educational planning (1968)

Methodologies of educational planning for developing countries by J.D. Chesswas (1968)

Monographies africaines (five titles, in French only: list available on request)

New educational media in action: case studies for planners (1967. Three volumes)

The new media: memo to educational planners by W. Schramm, P.H. Coombs, F. Kahnert, J. Lyle (1967. A report including analytical conclusions based on the above three volumes of case studies.)

Planning the development of universities—I (1971. Further volumes to appear)

Problems and strategies of educational planning: lessons from Latin America (1965)

Qualitative aspects of educational planning (1969)

Research for educational planning: notes on emergent needs by William J. Platt (1970)

Systems approach to teacher training and curriculum development: the case of developing countries by Taher A. Razik (1972)

The following books, produced in but not published by the Institute, are obtainable through normal bookselling channels:

Managing educational costs by Philip H. Coombs and Jacques Hallak
Published by Oxford University Press, New York, London and Toronto, 1972.

Quantitative methods of educational planning by Héctor Correa
Published by International Textbook Co., Scranton, Pa., 1969

The world educational crisis: a systems analysis by Philip H. Coombs
Published by Oxford University Press, New York, London and Toronto, 1968

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Inquiries about the Institute and requests for copies of its latest progress report should be addressed to:

The Director, IIEP, 7 rue Eugène-Delacroix, 75016 Paris